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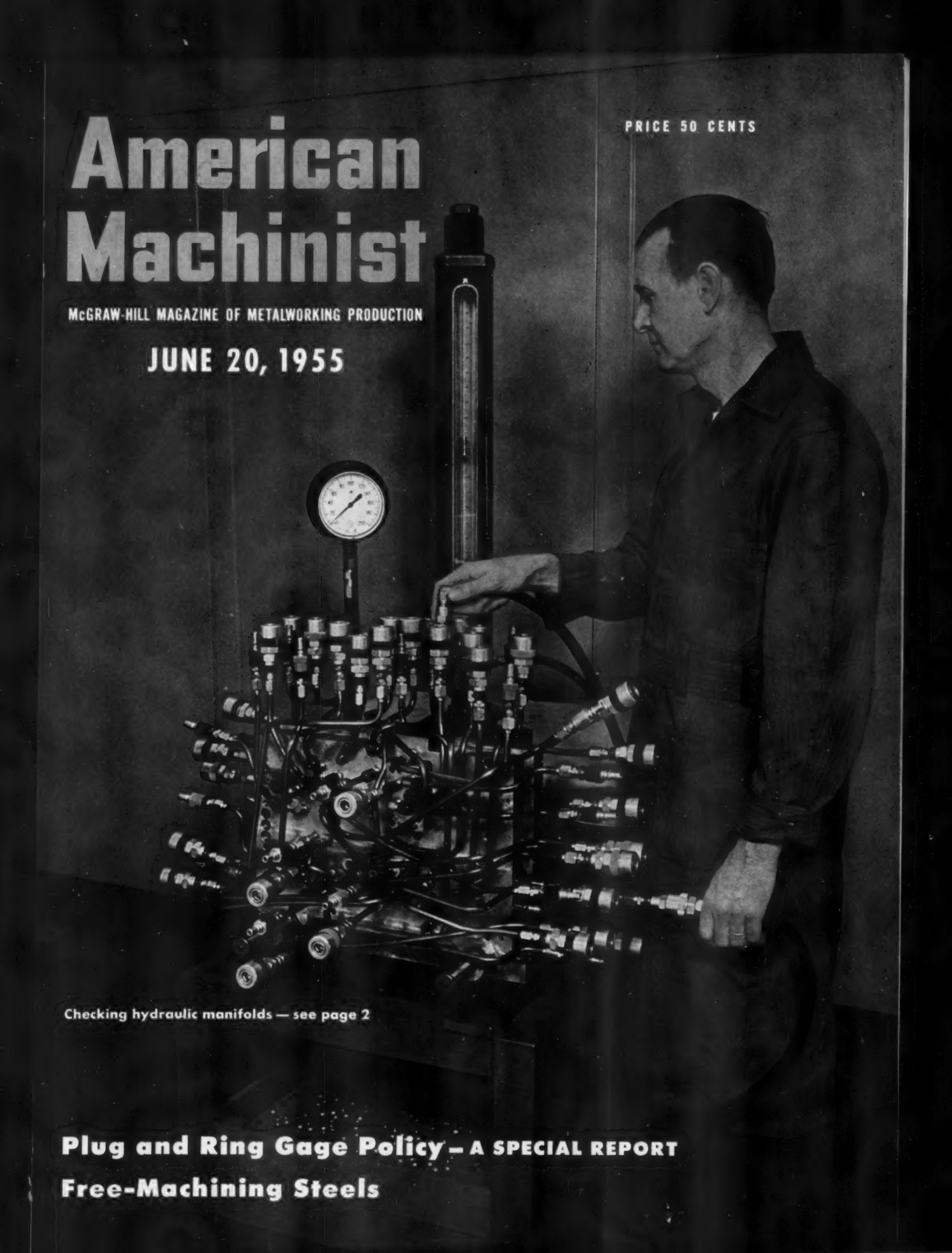
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

JUNE 20, 1955

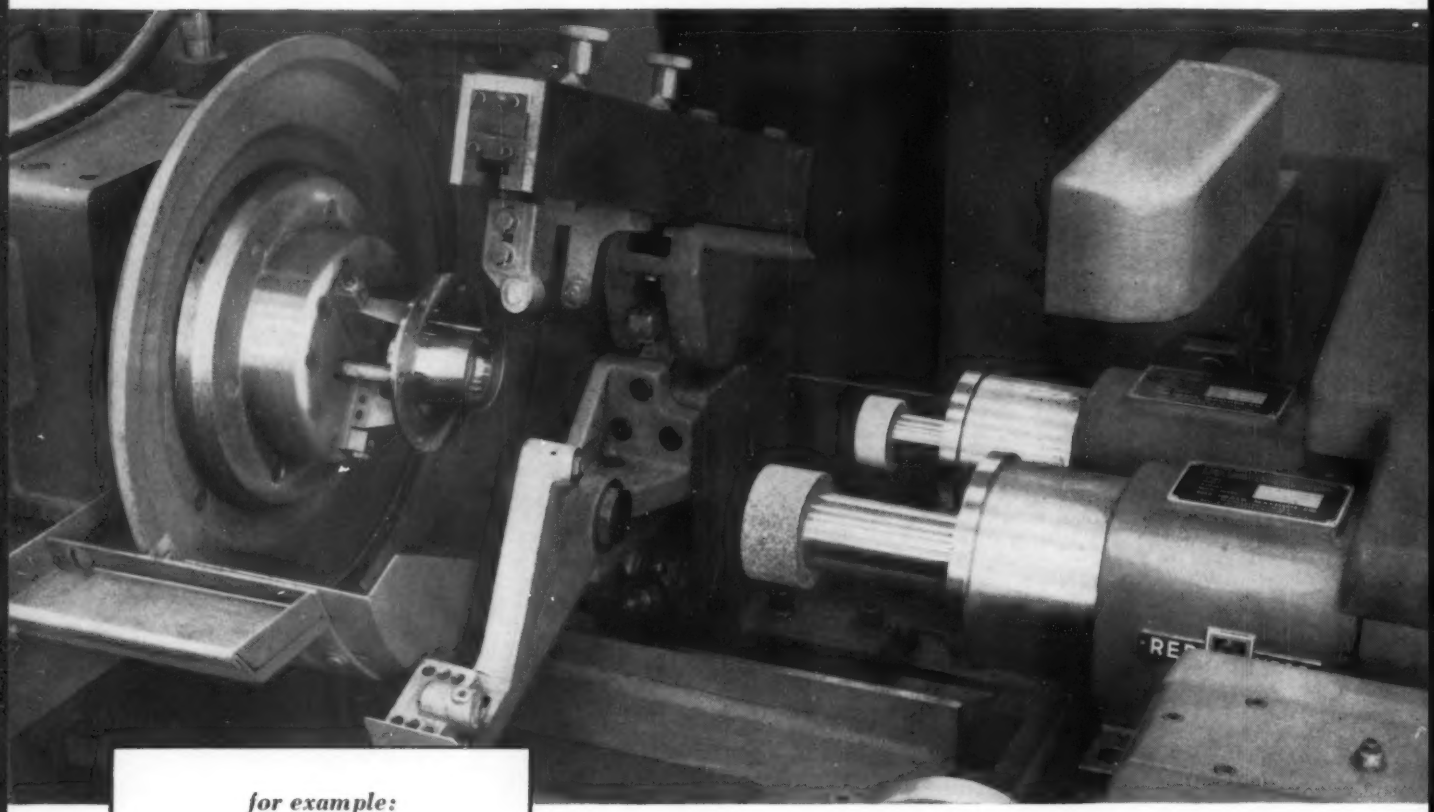


Checking hydraulic manifolds — see page 2

Plug and Ring Gage Policy — A SPECIAL REPORT

Free-Machining Steels

how to convert handling-time into grinding-time with a TWO-SPINDLE HEALD INTERNAL



for example:

This Model 271 Size-Matic grinds

SIX DIFFERENT SURFACES

at a single chucking

Finish grind I.D.—plunge grind bottom face—plunge grind hub face—finish grind O.D. — plunge grind flange face — finish grind flange O.D. *All* of these operations are done, at a single chucking on the Model 271 two-spindle internal shown above. And by reversing the part in the chuck, the same operations (except flange O.D.) are done on the opposite end — a total of 11 different surfaces on one part in one machine!

Fourteen identical machines are used by one manufacturer to grind 34 different gears and gear hubs, with interchangeable workholding fixtures. That's Heald *versatility* in action.

THERE'S no profit in handling-time. Loading and unloading—transferring parts from one machine to another—serve only to cut down the overall efficiency of any precision production operation.

Whenever you can combine bore and face grinding — or bore, face and O.D. grinding—on a two-spindle Heald internal, you convert handling-time into actual *grinding-time*. That means faster, more efficient production by performing two or more operations on a single machine, at a single loading. Moreover, concentricity and squareness between Heald ground surfaces are automatically held to extremely close tolerances.

The versatility of Heald two-spindle internals permits a wide variety of parts to be precision ground on I.D.s, O.D.s and faces in a high-speed, fully automatic cycle. Your Heald representative will be glad to show you how a double-spindle machine can cut costs on your multiple-surface grinding jobs.

it PAYS to come to Heald

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NUMBER OF COPIES PRINTED THIS ISSUE 38,508

chips

MANIFOLD CONNECTIONS . . . Much broader application of hydraulics in the design of a new Monarch lathe brought with it an accompanying problem in pressure transmission. The final decision was to replace complex tube layouts with manifolds. But the manifold also presented a tidy problem in sealing without leakage. Our cover shows a test stand with manifold undergoing check, and an article in this issue tells the story of how the sealing problem was whipped. Here are hints on leakproof brazing of aluminum.

PLUG & RING . . . Gagemakers take plug and ring gage tolerances in at least three ways: bilateral, unilateral, or commercial. These methods may or may not encroach on the product tolerance, may let some outsize pieces pass. Yet these gages are essential to inspection and quality control in any shop. To know the score at York Corp, York, Penna, D G Meckley III, manager, and F W DeHuff, supervisor, Quality Control & Inspection, assembled much information and charted the results. You can assess advantages and disadvantages of each system in our current Special Report, which they prepared.

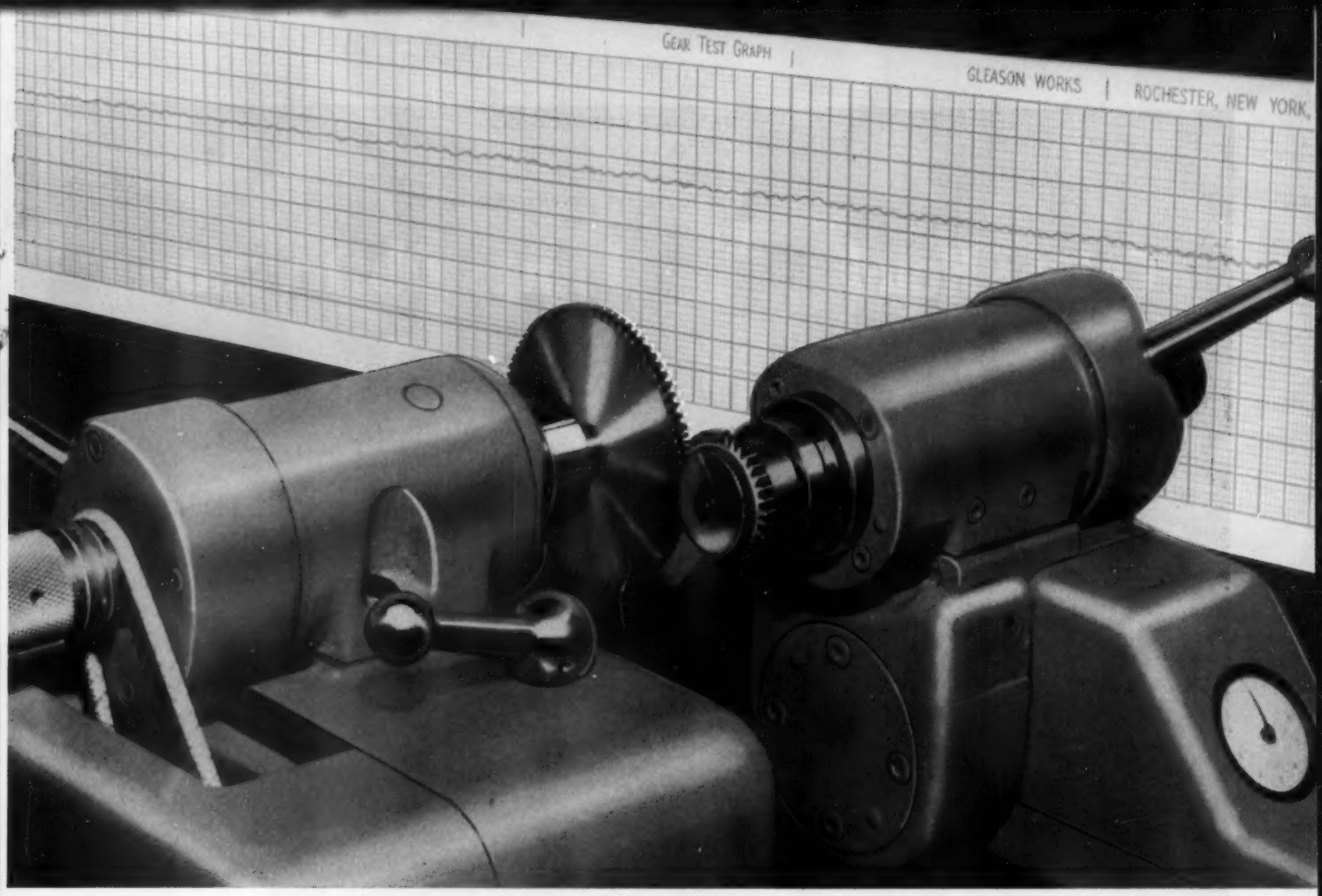
YOUR CHOICE . . . Richard Harvey (see biog), chief metallurgist at Brown & Sharpe, Providence, studied various screw-machine stocks, found that they do not always work out in production as they do in standard tool-life tests. C1119, for example, may be better than B1113 for many operations—for it is much better than handbooks indicate. A general revision of ratings is in order; the evidence is in our lead article.

TOOLING . . . Simmons Machine Tool developed a special machine for multiple drilling (you push *one* button) of three different end casings for electric motors. Here is unusual locating and clamping, set up to gage plate, and smart tooling to minimize non-cutting time. Wm Kraft, asst chief engineer, tells the story. . . . There's also a couple of pages describing an automatic boring setup at Ansco Camera. . . . R E Nixon of Adamas Carbide adds some important information in chart form on what nose radius to use on a carbide tool, then goes on to tell why a radius is necessary, its effect on tool life and work finish. . . . Startling increases in tool life and cutting speed with carbides are reported from Douglas El Segundo (Torrence, Calif, plant) from diamond-lapping to 1 mu in., rms. This you should know, but did you remember?

CONTROL . . . Producto Machine Co, Bridgeport, Conn, has a complete system of production control, combining IBM records and Executone reporting. It gives in a few minutes the progress and cost on any job, plus machine loading, backlog, and bottlenecks. Better study the ideas in this 3-page article.

COMING . . . July 4 *AM* will mark the day appropriately, with a very special cover and a very special Special Report. Both are keyed to the forthcoming Chicago Shows, but more importantly, to your job and ours. There are also articles on tap ailments, forming stainless, lapping, hobbing splines, machining beryllium, plating, automatic zipper assembly, and a homemade press.

STEP QUENCHER . . . Richard F Harvey was born in Springfiell, Mass, Jan 22, 1914. He is a graduate of Worcester Polytechnic Institute and served an apprenticeship in heat treating at Simonds Saw & Steel Co, in Fitchburg, Mass, where he became assistant metallurgist. Mr Harvey was the developer of "step quenching" for better, more-uniform hardening—a process now used by almost every steel-hardening firm. He has been chief metallurgist at Brown & Sharpe since 1947, having started to work there Jan 22, 1940. His article on screw-machine steels leads this issue.



Make a complete test and record of your small spur and helical gears

You can be certain that your spur and helical gears will operate correctly in their final mountings if you give them a complete test *before* actual assembly.

The new Gleason No. 104 Spur Gear Tester gives you a complete check of your gears. A rolling test for composite error provides a quantitative check of tooth spacing, profile shape and runout.

In this test, the gears are slowly rotated while a calibrated spring load keeps them in metal-to-metal contact. Any error in the gears results in a horizontal movement of the drive spindle. A completely electronic pickup and recorder make a *permanent* chart of the results.

But there is still another test you can make with the No. 104 Tester—a running test, which simulates actual operating conditions, determines the smoothness of operation, noise characteristics, and tooth contact, which will actually be obtained when the gears are used.

This machine tests precision and commercial gears up to 4½″ center distance.

We will gladly furnish further information on the No. 104 Spur Gear Tester. Write for our bulletins.

The No. 104 Tester is furnished complete with an electronic pickup and recorder unit, as shown above.

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Builders of bevel gear machinery for over 90 years

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51

Cutter Head Jumps Obstruction

CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine with automatic fixtures for milling the serrations in both ends of brake pedal shafts, at a production rate of 123 per hour.

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MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING

to Mill Two Sets of Serrations in One Cycle

Costs descend vertically and operators are happy with the automatic equipment illustrated here. It's a CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine, with a magazine type fixture. All the operator has to do is stack work on a shelf; the machine and fixture take over the job of loading, clamping, milling and ejecting. ¶In one operation, serrations on both ends of brake pedal shafts are automatically milled with this setup. The machine's hydraulic rise and fall feature is the deciding factor in taking these two milling cuts. After taking the first cut the spindle carrier automatically rises, the table repositions, and then the carrier advances down to accurate depth for the second cut. Production averages 123 shafts per hour. ¶CINCINNATI No. 0-8 Automatics have many features of value for this type of work, and our Application Engineers have the know-how to tool them up to your requirements. Would you like to know more about CINCINNATI No. 0-8 Automatics? Ask for catalog No. M-1607-2.

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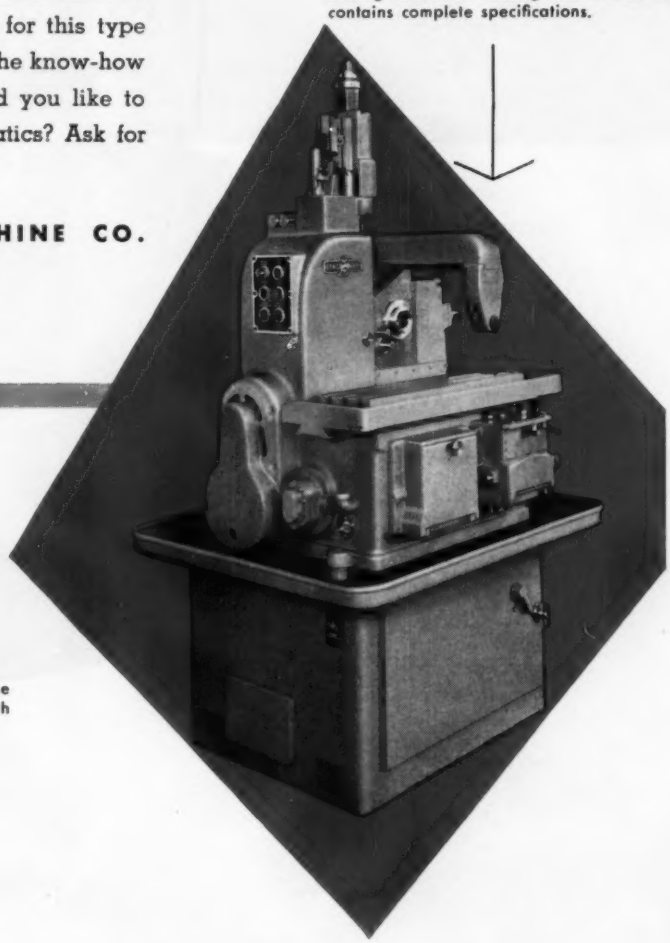
CINCINNATI 9, OHIO

MACHINE TOOL SHOW
INTERNATIONAL AMPHITHEATRE
CHICAGO, ILL.
SEPT. 6-17, 1955
BOOTH 1205

CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machine. Catalog No. M-1607-2 contains complete specifications.



Drawing of part and diagram of automatic cycle

Part name	Brake pedal shaft
Material	Steel
Operation	Mill serrations, both ends
Cutting speed	110 ft. per minute
Table feed	12" per minute
Production	123 per hour
Equipment	CINCINNATI No. 0-8 Automatic Rise and Fall Milling Machines, with automatic fixtures

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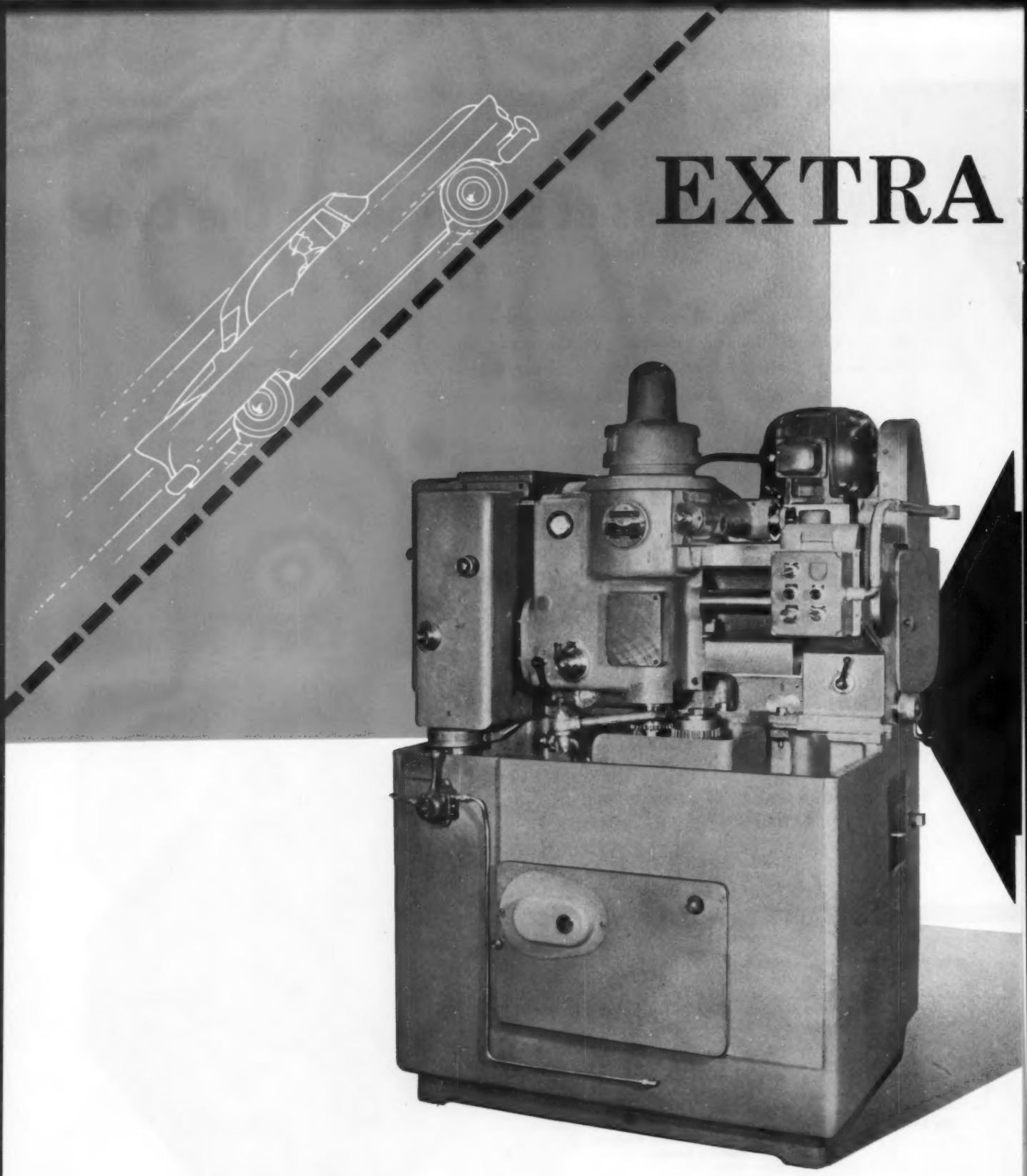
MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

EXTRA



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...to level off "production peaks"

The Fellows No. 4GS Gear Shaper safeguards your schedules at production peaks– keeps gear costs on the down grade.

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The All-New Fellows No. 4GS Gear Shaper is a powerful, rigidly constructed machine tool that can remove stock FAST! It can finish-cut gears faster... and within closer tolerances...than ever before.

Look at these features: Rugged drive mechanism to match its 3⅜" cutter spindle! Reciprocating cutter speeds from 98 to 635 strokes per minute! Rotary feeds from 0.008" to 0.024" based upon 4" p.d. cutter! Ideally suited for automatic loading and unloading in the smaller size range...complete production cycle! CAPACITY: 6" p.d. x 2" face!

Recently introduced to industry, the Fellows No. 4GS is setting enviable production records. We invite you to get the complete facts from your Fellows Representative. Ask about the Fellows Plan for deferred payment. Write, wire or phone any Fellows Office.

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...with Van Norman

Finish grinding two diameters of rear end pinion. Production increased by 50% with this heavy-duty Van Norman Production Grinder.

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PRODUCTION 50%

Production Grinders

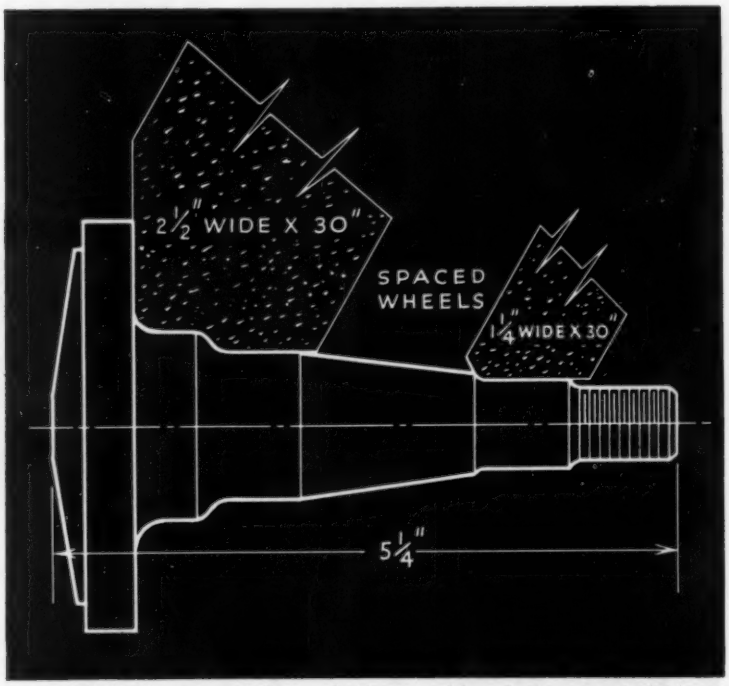
8 TONS OF MASSIVE RIGIDITY

Like all Van Norman Production Grinders this rugged, heavy-duty machine is precision engineered and built to assure maximum grinding accuracy at high production rates.

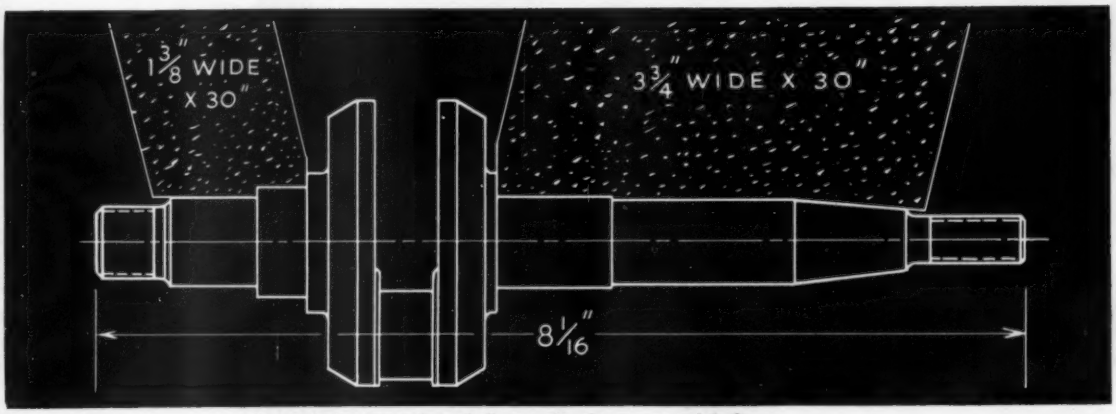
You, too, can boost grinding output, cut costs with Van Norman Special Production Grinding machines. They can be designed with single or double head grinding wheel units. Our engineers will gladly work with you on your particular problems. Write for their assistance.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on four purchase plans — Outright Sale . . .Purchase on conditional sales contract up to 5 years . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export.



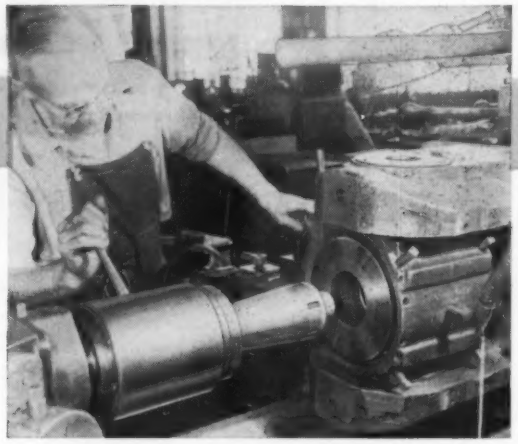
A single head angular grinding application on a pinion using two spaced wheels.

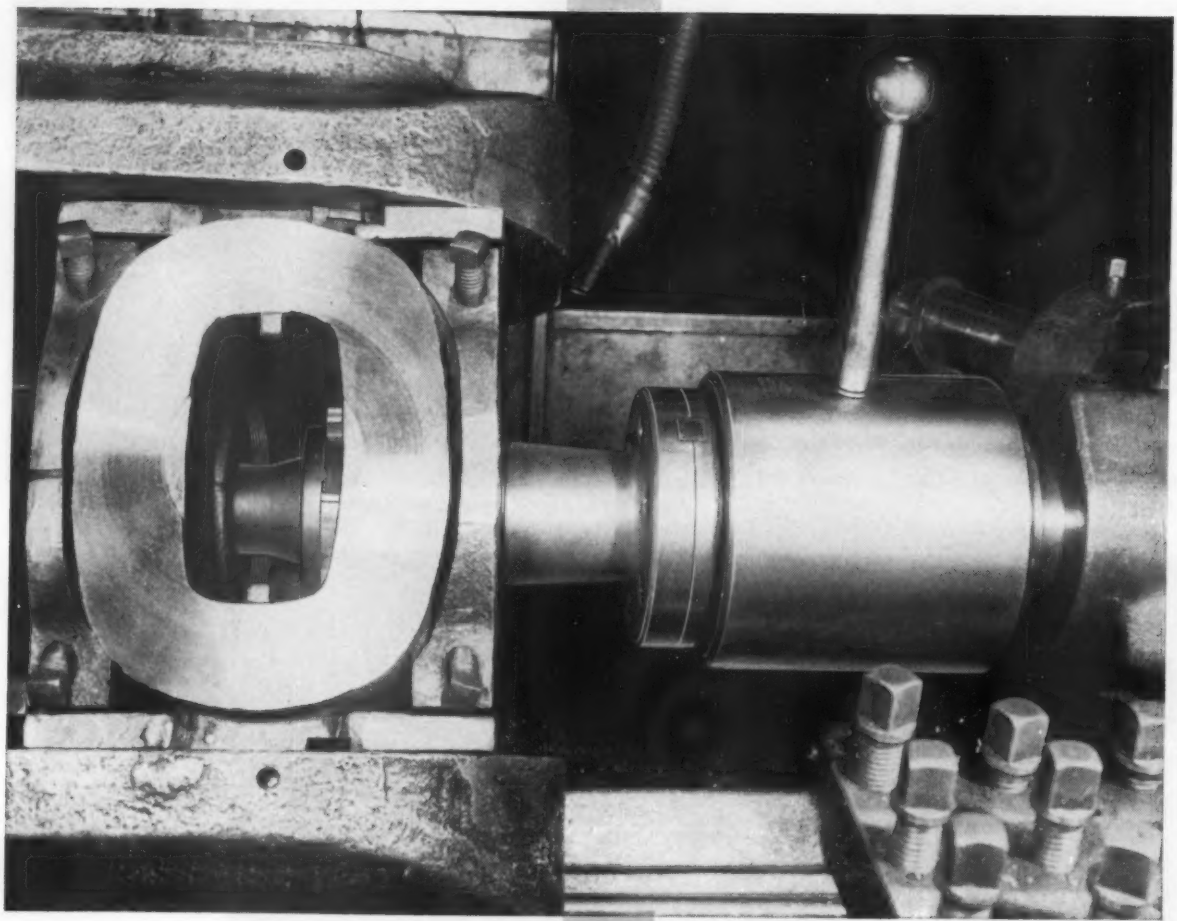


A double head angular grinding application on a crankshaft.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS





tapping threads from inside out

Seats are *tapped* in gate valves by using LANDIS Valve Taps, even though the diameter of the thread exceeds that of the valve port.

The use of a 6VB LANDIS Valve Tap at the Kerotest Mfg. Co., Pittsburgh Pa., illustrates the method and results of this operation. Specifications require 5" 12-pitch UN threads cut 5/8" long to Class 3 fit in 4" steel body castings.

Even though the seat thread diameter exceeds that of the valve port, the "collapsing action" of the tap (which withdraws the chasers into the head) gives sufficient clearance to move the tap into the port. The chasers are then expanded (from 3/4" on smaller taps to 2" on larger sizes) within the valve body, and threads are tapped outward as the lathe carriage is moved rearward by the leadscrew. (Note: Special chasers are available on certain of these operations that enable threading the opposing seats without removing the tap from the valve body.) After completing the thread, the tap is again collapsed and withdrawn.

Threads are cut at 12 R.P.M., and 100 threads are completed before regrinding the chasers. Each set of chasers produces an average of 700 pieces, excellent life with the short throat or chamfer required in this particular operation. Operation of the tap is by hand, and the valve body must be indexed 180° to thread the opposing seat.

LANDIS Valve Taps are available for diameters from 2" to 24", and each tap body can be equipped with tap heads of various sizes to thread many different seat diameters. Note that these taps feature a tapered head, of great value where valve seats are inclined at an angle to the port opening. This allows tipping the valve body into threading position after the tap has entered the port. More information on request—please send drawings.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT CUTTING-TAPPING-GRINDING-ROLLING

LANDIS *Machine* COMPANY

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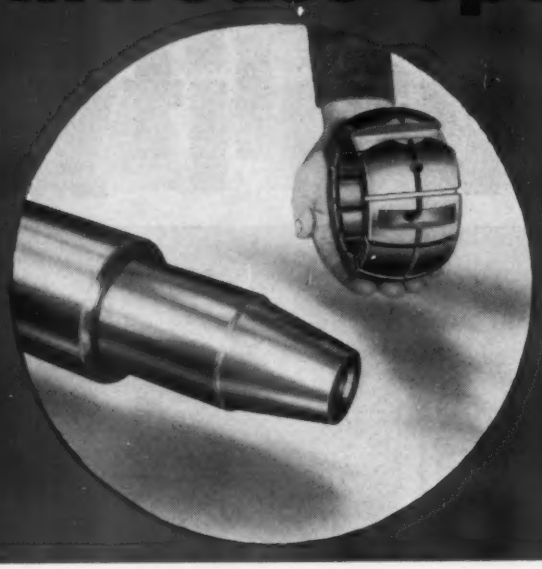
Landis 10" x 36" Type CH Plain Grinder

LANDIS

precision grinders

increase operator output



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"Rigidized" Microsphere bearings and spindles increase production by heavy cuts without loss of finish and accuracy. A Landis exclusive.

SETUP TIME REDUCED

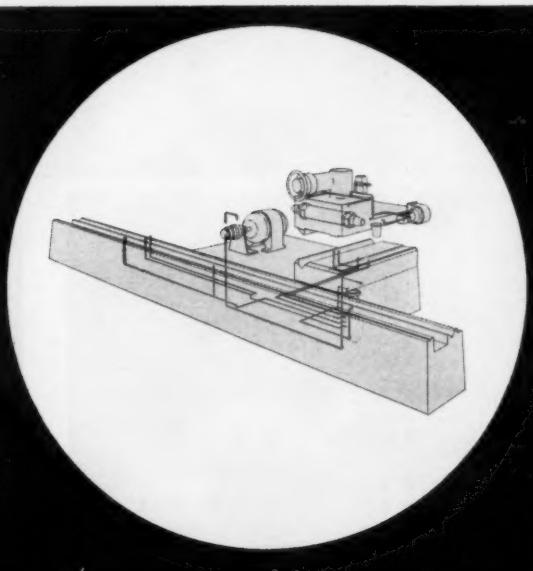
Centralized controls speed setup to give more production time. Controls handy for operator save motion and reduce fatigue.

EYE LEVEL WHEEL FEED

The wheel feed is at eye-level—Easy for operator to watch grinding and wheel feed graduations without moving.

PROTECTED LUBRICATION

Automatic spindle and way lubrication for dependable operation and machine protection. This is a schematic diagram.



LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

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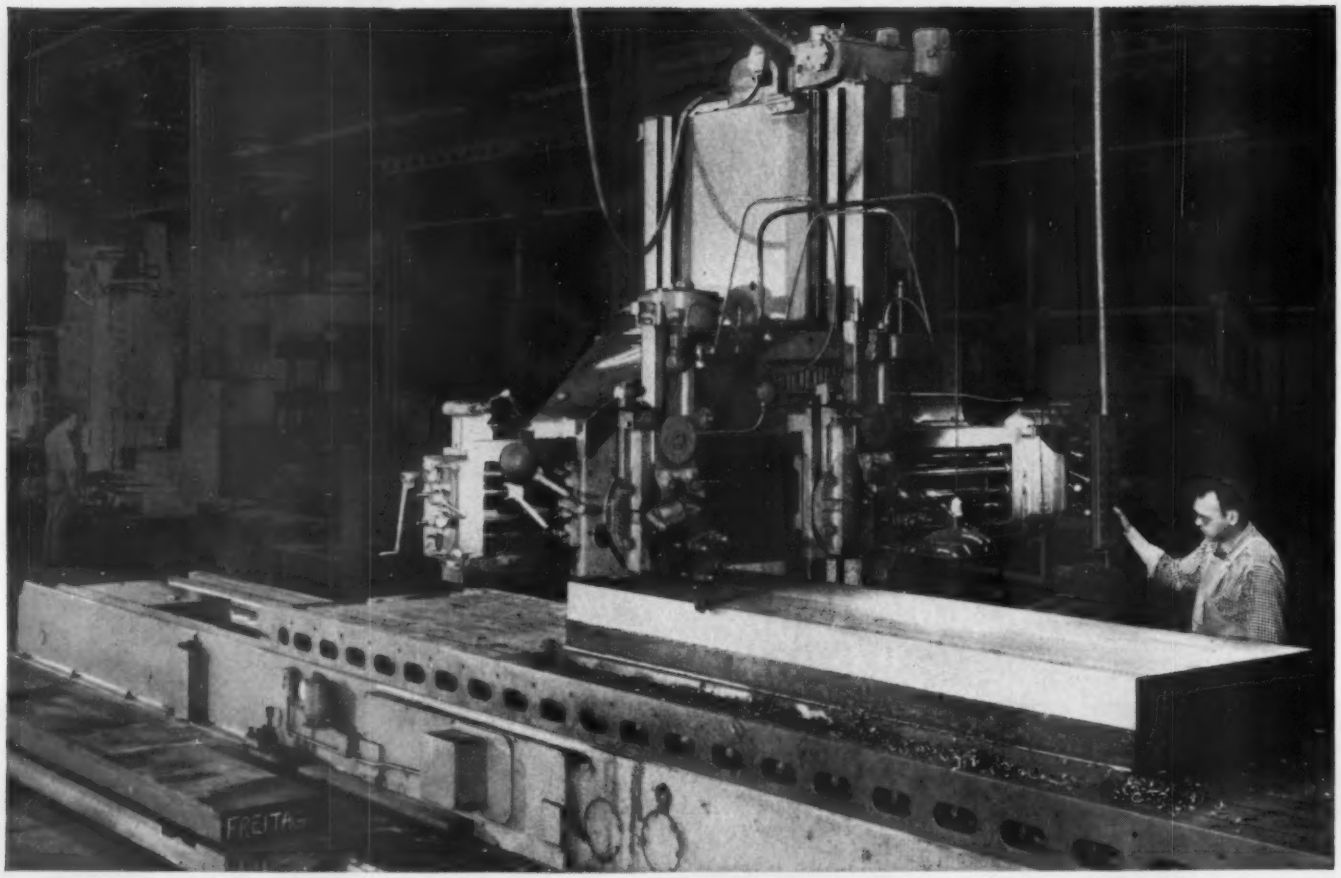
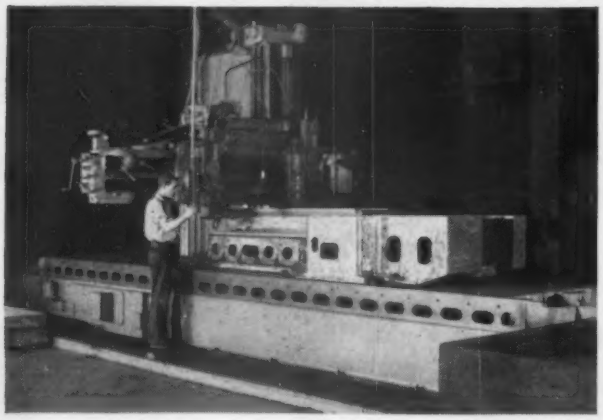
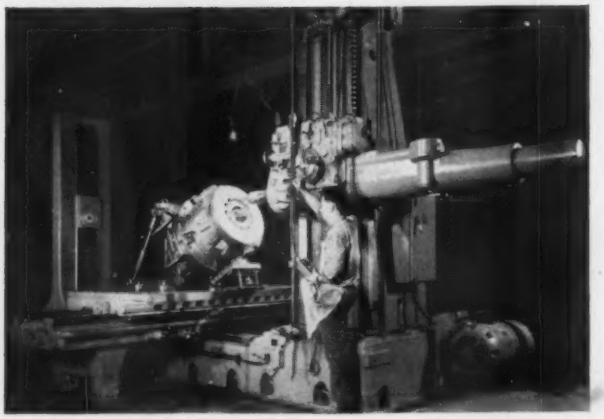




Here's a typical example of a large workpiece being planed on a Giddings & Lewis 62" x 60" x 24' Openside Planer. The planer's openside construction simplifies setup of unusually large workpiece that requires the full range of the machine. What's more, it holds tolerances within ten-thousands and provides greater flexibility of operations at high speeds.



This special mold for a die-cast engine part is precision-machined to close tolerances on Giddings & Lewis' Model 350-T Horizontal Boring, Drilling and Milling machine. The 350-T is equipped with extended saddle and saddle supports, also a micrometer measuring device which permits readings to .0001" of vertical travel of headstock and cross travel of machine table on the saddle.

quicker delivery parts with Giddings & Lewis Hypro Openside Planers and Model 350-T Horizontal Boring, Drilling and Milling Machines

—says report from R. H. Freitag Manufacturing Co.

MANUFACTURING plants everywhere depend on R. H. Freitag Mfg. Co. of Akron, Ohio to produce superior products to exact limits of precision at lower cost. Contributing to this outstanding ability are four Giddings & Lewis precision machines which provide the means to faster cutting, heavier cuts, better finishes and above all greater accuracy.

Extremely versatile, the G&L's are the busiest machines in Freitag's modern machine shop. They produce many intricate parts required in the manufacture of aircraft, automobiles, tools and dies, and components for other major industries.

Two heavy-duty Model 350-T (Table type) Horizontal Boring, Drilling and Milling machines (5" dia. spindles) are equipped with extended saddle and saddle supports. They also feature an Automatic Electric Positioning Device which selects and controls the distances between machined holes. In addition, there are two G&L Hypro Openside Planers—a 48" x 48" x 32' machine and an extra heavy-duty 62" x 60" x 24'.

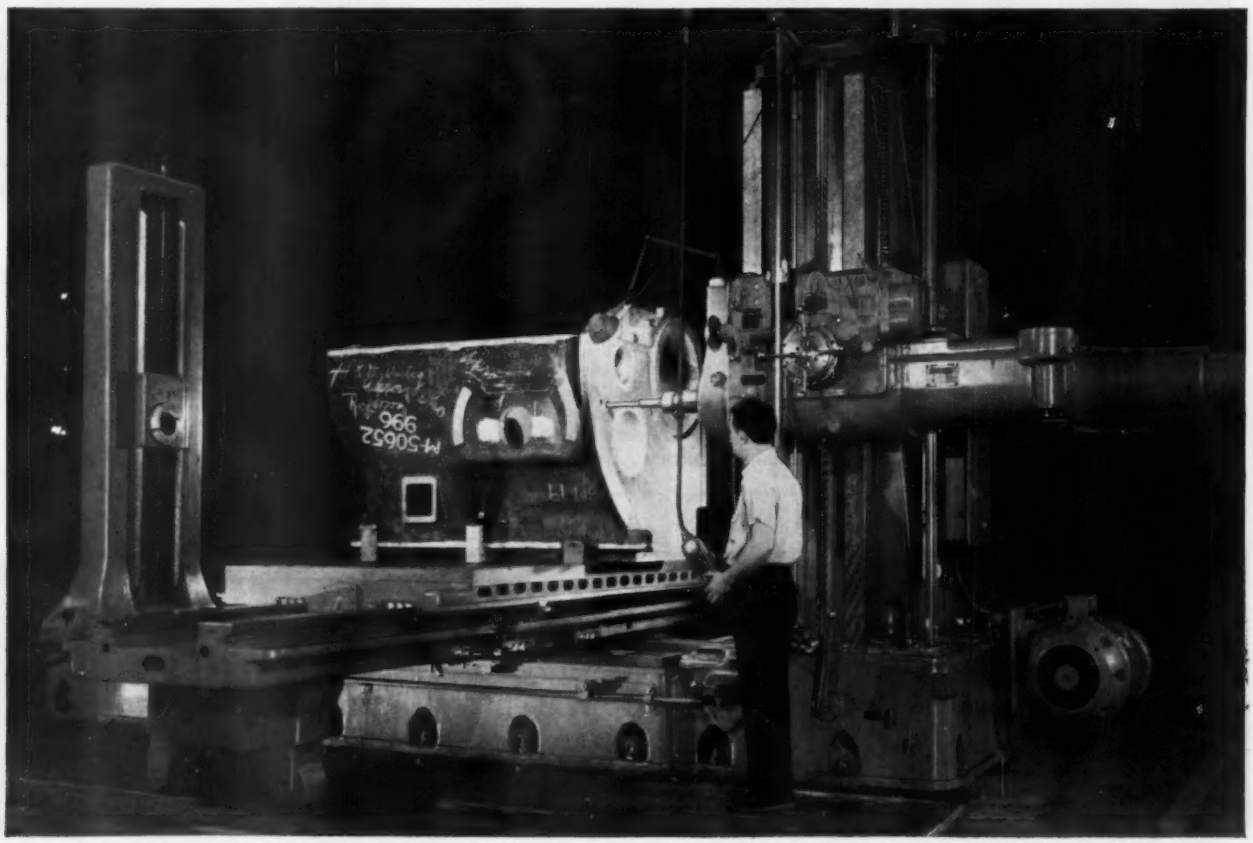
For more information on how machines like these can help you perform an exceptionally wide variety of operations, see your Giddings & Lewis representative, or write direct to factory.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

BOOTH NO. 710

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; Hypro Double Housing and Openside Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting tools.



fused quartz

VK OPTICAL FLATS

Accurate to .000001"

With VK Optical Flats, close checking of flat surfaces is simplified and more conveniently handled.

Shown here is the new Van Keuren monochromatic light, 22¼" wide, 17¼" high and 20" deep (in bench space). It is designed for use with large optical flats such as the one shown—a 10" diameter fused quartz double-surface master flat (accurate to .000001" both sides).

VK Optical Flats are available in sizes from ½" diameter to 10" diameter in .000001", .000002", or .000004" accuracy. They can be shipped within 30 days from order.

Catalog and Handbook No. 35 is available by writing: The Van Keuren Co., 173 Waltham St., Watertown, Mass. Ask for your copy.

VK

36th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages.

Multiple spindle automatic builders do not deny the importance of good frame design. As early as 1920 Cone's revolutionary frame was substantial evidence that Cone did something about it.

For some time there has been discussion concerning the relative merits of the use of 100% carbide tooling on multiple spindle bar automatics. There has been very little information made available about successful carbide application to this type of machine by its builders or by carbide suppliers. But Cone is doing something about it.

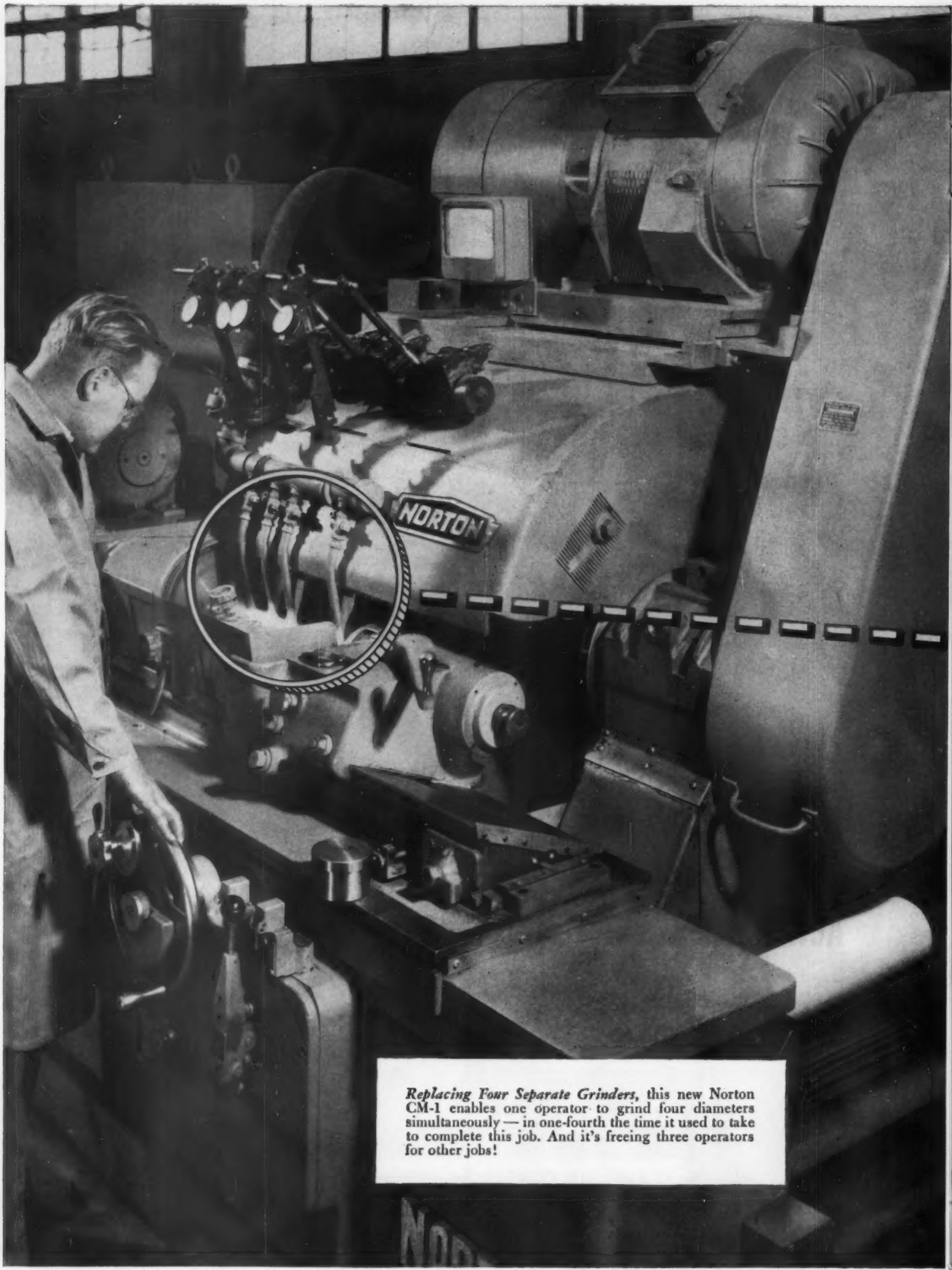
The Conomatic Carbide Development program is accumulating much helpful information for "automatic" users through test runs under production conditions. The illustration is an example of such information applied to an actual production run. Full data is available.

Action speaks better

MATERIAL—ALUMINUM: Hole drilled with 1" and 1 1/16" dia. drills to 1½" depth, and tapped to ¾" depth.

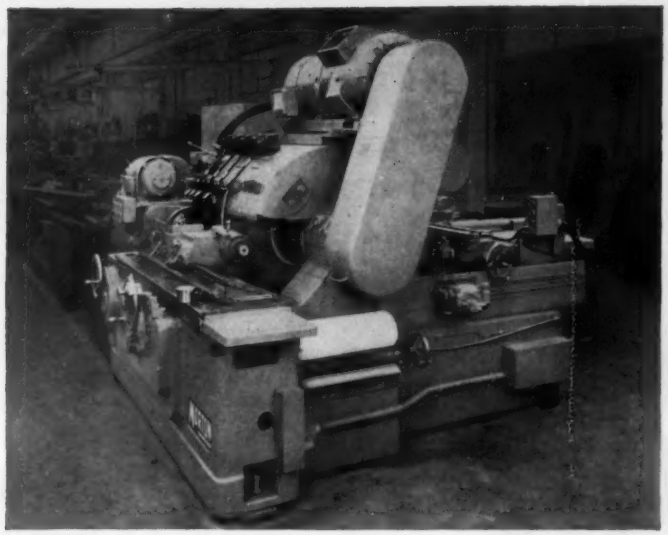
	HSS	CARBIDE
Cycle Time	90 secs.	11 secs.
Work Spindle Speed	270 R.P.M. at 104 S.F.	830 R.P.M. at 320 S.F.
Tool Wear	5,000 pcs. per grind	20,000 pcs. per grind

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



Replacing Four Separate Grinders, this new Norton CM-1 enables one operator to grind four diameters simultaneously — in one-fourth the time it used to take to complete this job. And it's freeing three operators for other jobs!

What You Can



A Great New Production Tool. The Norton Type CM-1 Heavy Duty Semi-automatic Multi-Wheel Grinder brings new efficiency and economy to the grinding of parts having multi-diameters—such as crank and cam-shafts, transmission and motor shafts, etc.

Here's a new Norton Grinder to

boost your production rate

400% or higher

Type CM-1 Heavy Duty Multi-Wheel Grinder does four or more jobs at once, reduces capital investment, cuts operating time and costs

When you can get one machine that does the work of several, in a fraction of the working time, you save considerably on purchase costs, on operating costs, and on floor space.

That machine is now ready to go to work for you. The new Norton CM-1 makes four or more cuts in a single plunge-grind cycle, operating automatically under one-lever control. And it completes each separate grinding operation with the accurate, trouble-free performance that's built into every Norton grinding machine.

Typical Advanced Features

- Cartridge type bearings at each end of heavy, 12″-diameter wheel spindle assure extreme rigidity of spindle, longer wheel life, greater accuracy and control with minimum truing.
- **Automatic truing device — in rear, out of operator's way — trues straight or formed wheels each individually, yet all at once, thus requiring only the amount of time needed to true widest wheel.**
- Automatic compensation for collective wheel wear, including amount trued off. No adjustment or resetting of wheel needed after truing.
- **Optional equipment includes built in automatic sludge remover and coolant filter, constant peripheral wheel speed control, increased power for wheel or work drive, etc.**

Why not get the complete story of how the CM-1 can benefit your grinding operations? See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to bring you the "Touch of Gold" — to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

Learn About Holes

What You Can

WITH SHEFFIELD'S PRECISIONAIRE

CHARACTERISTICS

High precision with instant response

•

Has widest amplification range — 100 to 100,000-1

•

Accommodates widest tolerance range — .000005 to .100

•

Amplifications and tooling interchangeable

•

Provides quickest change in amplification

•

Longer scale facilitates classifying parts and provides greater approach range

•

Easier to read — no need to squat and squint

•

Human error minimized

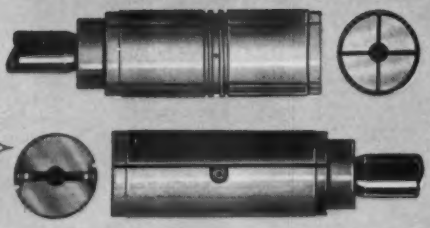
•

Checks one dimension or many simultaneously

•

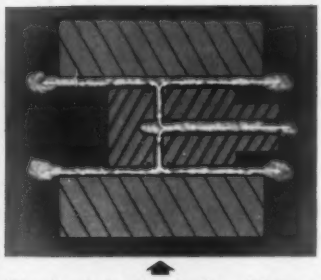
Elements have long service life

BASIC INTERNAL TOOLING ELEMENTS

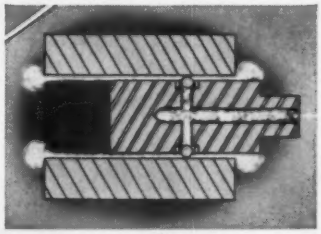


AIRJET SPINDLE

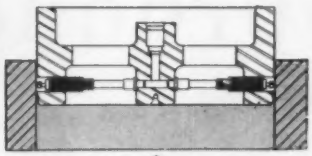
For True Diameter



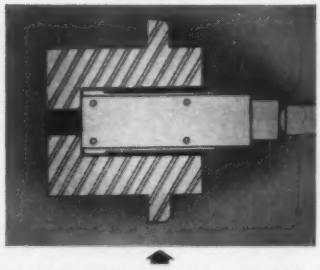
Standard stock spindle with two diametrically opposed open jets for holes having tolerances of .005" or less and surface finishes of less than 65 rms.



Balljet Spindles used for holes in porous or soft materials and for internal surfaces rougher than 65 rms.

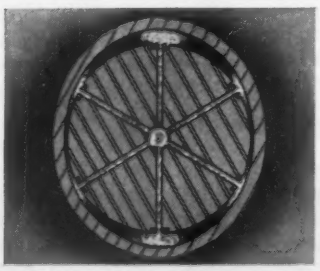


Plunjets mounted in a suitable fixture are used for larger holes and those having larger tolerances.



Bladejet Spindles are used in interrupted bores, bores having a keyway, to gage to the very bottom of a blind bore and for larger tolerance bores.

Adjustable spindles and kits are available to cover ranges of ⅜" to ⅞"; ⅞" to 1½"; 1" to 3"; 1½" to 3" and 3" to 12".



For Average Diameter

Spindles having three or more jets equally spaced around the perimeter—especially effective in checking thin wall components.

7210

MORE PRECISIONAIRES BOUGHT . . . . . .

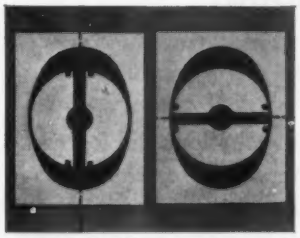
Learn About Holes

BALLJET SPINDLE

BLADEJET SPINDLE

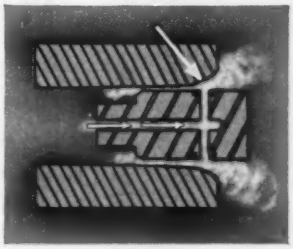
PLUNJET CARTRIDGES

For Out-of-Round



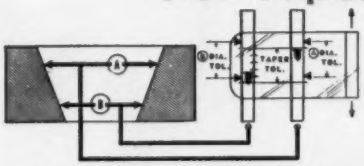
Indicated when any spindle is rotated through 90 degrees.

For Bell-Mouth



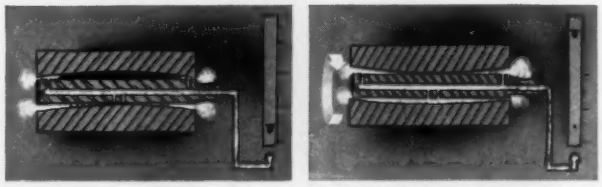
Indicated as any spindle enters or is withdrawn from the bore.

For Taper



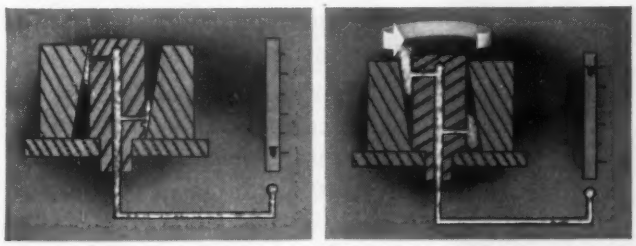
Indicated as any spindle is passed through the bore. Spindles having two or more sets of jets may also be used. In larger bores and/or those having larger tolerances, Plunjets in a suitable fixture are used.

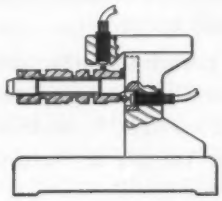
For Camber



Camber or straightness of a hole is checked by rotating through 180° a spindle having four jets as indicated.

For Squareness of a Bore Axis with a Face

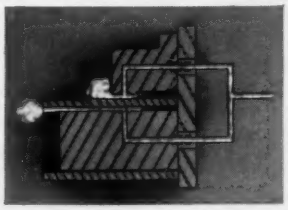




Spindle with opposed open orifices spaced longitudinally checks squareness of a bore axis with a face.

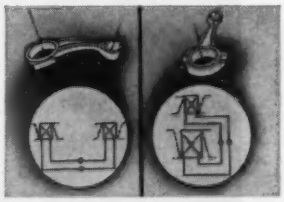
Plunjet fixtures may also be used.

For Concentricity



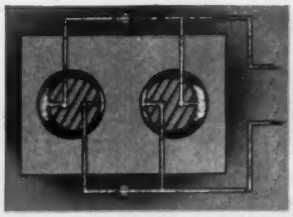
Opposed jets in a locating fixture.

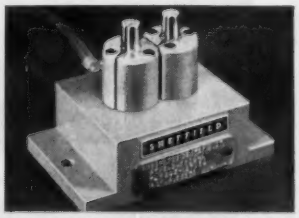
For Parallelism of Holes



By integrating two spindles in a fixture, such as those used for squareness checking.

For Center Distance Between Holes





By a fixture with two spindles each having two opposed jets.

*For checking external dimensions, relationships and countless other conditions, write to Div. 600, **THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.**

SHEFFIELD MASTER CRAFTSMAN HEADQUARTERS

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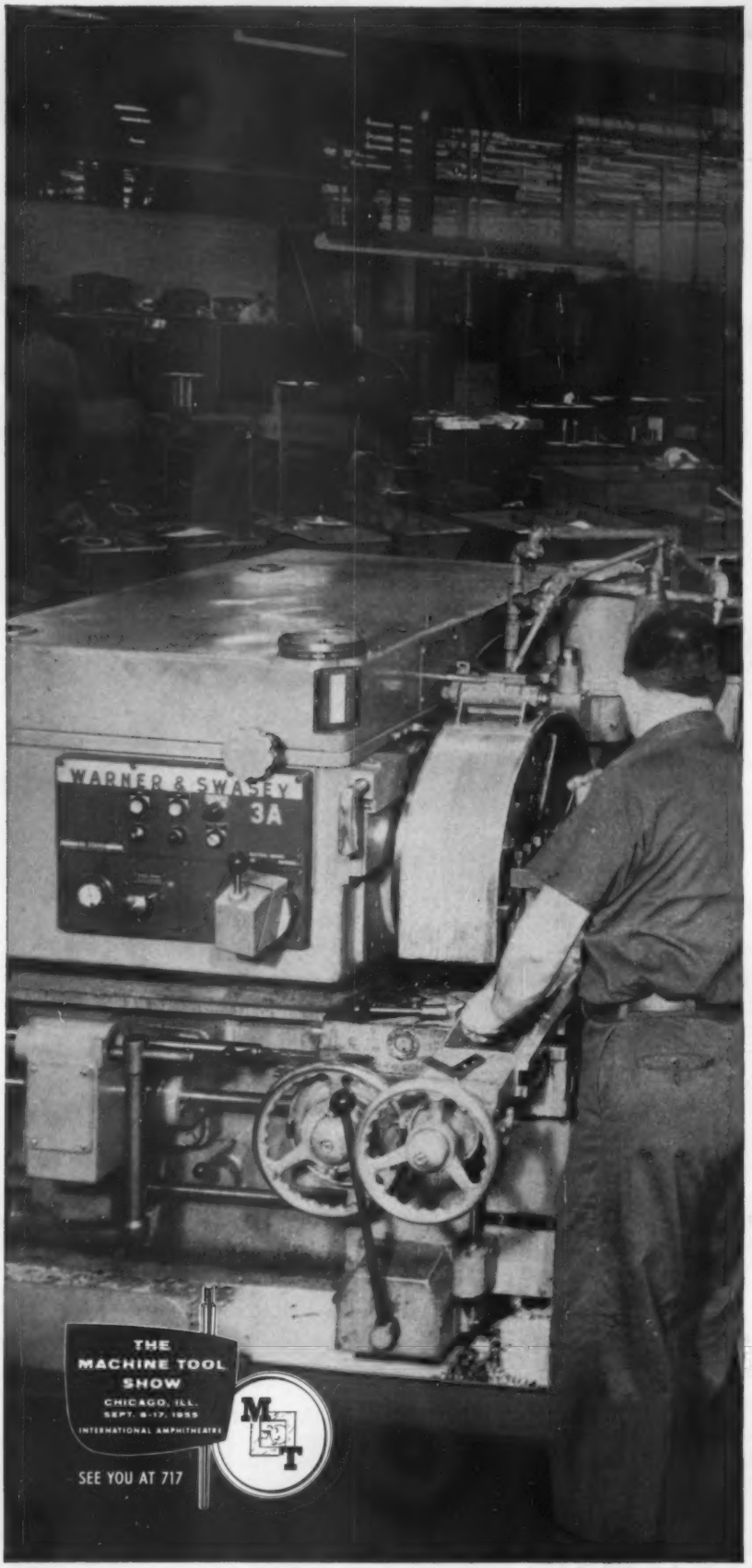
MANUFACTURE AND MEASUREMENT FOR MANKIND

THAN ALL OTHER MAKES OF AIR GAGES



Warner & Swasey 3-A's show 5-way production gain for Goss!

You've read all about the features—now here are *performance facts* about the new, extra-heavy duty Warner & Swasey saddle type turret lathes.

This report comes from Goss Printing Press Company who selected two new Warner & Swasey 3-A's for small-lot, high precision printing press parts. These machines, part of their dynamic replacement program, replaced two 1941 turret lathes.

In this business machining accuracy requirements are high, for giant roll presses must print up to 2,000 feet of paper per minute—and the only guide for this ribbon of paper is the parallelism of the rolls to each other.

Here are the performance factors that Goss reports speeded production and added up to *30% savings* from their new Warner & Swasey installation:

Higher top speed of 851 rpm. makes it possible to maintain recommended surface speeds on more work diameters. Before, only the larger diameters could be machined at recommended speeds.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A

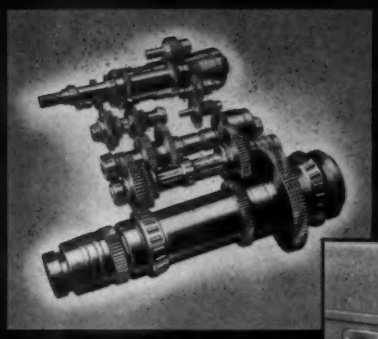
More speeds quickly available in their working range. Because of Goss' small lot production, averaging about 10 pieces, work diameters vary from small ¾" bores all the way up to maximum machine chucking capacity. The Warner & Swaseys' 32 easily-obtained speeds permit selection of the right speed for the particular cut. Instead of two or three speed changes per job, they are now more likely to make four or five.

Built-in accuracy and rigidity has made it possible for Goss operators to eliminate the non-productive time previously necessary for "inspections" to maintain specified tolerances. Now entire lots are run with only spot checks after the first piece. They bore 3½" diameter sleeves 12" long to within a .0005 end-to-end taper tolerance, and within .0005 total tolerance on the bore! Previously such bore tolerances required reaming. Improved tool life is also attributed to the machines' greater rigidity. Feeds and depth of cut have, at the same time, been increased.

Increased horsepower now permits running all jobs at recommended surface speeds of 400 surface feet *and higher!* It has also permitted more frequent use of combined and multiple cuts, again saving machining time.

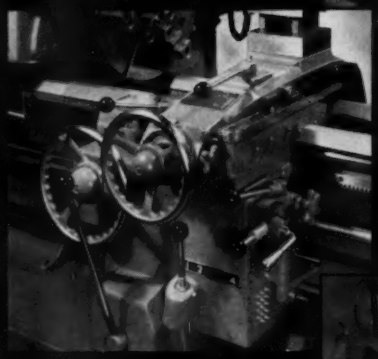
Handling ease of the new 3-A's has them all talking in the Goss shop! They'll tell you about the new automatic headstock, with its shifting ease and direct reading preselector dial. Operators like the time and effort saved by the power chuck wrench, and praise the machines' single rapid traverse on the cross slide apron, and the zoned controls.

That's the Goss report. And if you've read "between-the-lines" production advantages for *your* shop, call in our Field Engineer for more facts!



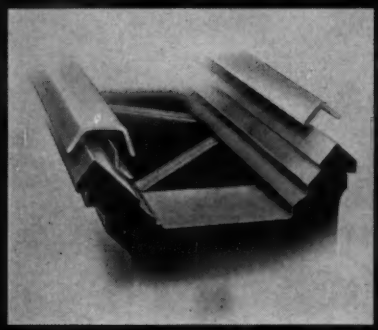
New **16-SPEED HYDRAULIC DRIVE** provides closer grouping of speeds in natural work range — 32 unduplicated speeds with two-speed motor!

New **SPEED PRE-SELECTION** by direct reading dial while under cut. Effortless AUTOMATIC GEAR SHIFTING by single lever.



New **ZONED CONTROLS**— single lever rapid traverse on cross slide apron. All controls on apron and headstock grouped within easy reach.

New **POWER**—as much as you'll need for any job! Motor ranges: 1-A, 15-30 hp. 2-A, 20-40 hp. 3-A, 30-60 hp. 4-A, 40-75 hp.



GREATER RIGIDITY AND ACCURACY from induction hardened Vee-ways and gib design, plus scientific diagonal rib design of bed—all Warner & Swasey *exclusives!*

75TH ANNIVERSARY YEAR
WARNER & SWASEY
Cleveland
PRECISION MACHINERY
1880 — 1955

WARNER & SWASEY

Here's a to spark

Remington Rand makes this quality steel part at less cost from Republic cold drawn special sections

REPUBLIC STEEL CORPORATION
3102 East 45th Street
Cleveland 27, Ohio

REPUBLIC STEEL

Please send more information on:

☐ Cold Drawn Special Sections ☐ "Nylok" Nuts
☐ High Strength Steels ☐ Tool Steel Warehouse Service

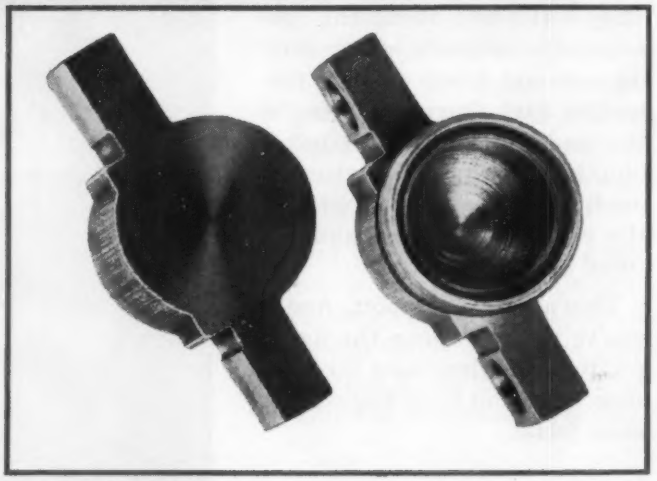
Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

E-9433



THE AUTOMOTIVE INDUSTRY is a large user of Republic Special Sections. This wing bushing, above right, for a universal joint is made from the special shape shown above left.

cost-saving idea your imagination

The part is the margin rack for Remington's new Office-Riter. It is produced at less cost because much of the machining is eliminated. The production men at Remington Rand put it this way, "To produce this part from raw bar stock would require costly machining and would result in an inferior part." So they use Republic Cold Drawn Special Sections preformed to the predominating cross section of the part.

If you produce or design steel parts and are interested in reducing costs, you'll want to know more about cold drawn special sections supplied by Republic's Union Drawn Division. You'll want to know more about these advantages.

1. Flexibility in design is almost limitless.
2. Shapes obtainable in one piece replace costly assemblies.
3. Special sections simplify built-up, interlocking, or associated parts.
4. Benefits from cold drawing are higher strength, greater hardness, a bright smooth finish that rarely requires further machining.

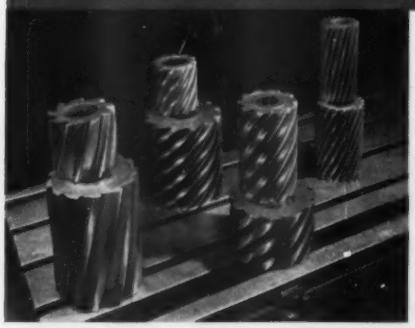
Sections are made to your specifications in all grades of carbon, alloy and stainless steel. While large tonnage requirements are not necessary, they do result in greater economies. We can supply cold drawn special sections in large or small quantities to meet your requirements.

Give you an idea? Send us samples or blueprints of your parts. We will tell you promptly and impartially whether the nature of your parts would make the use of Republic Cold Drawn Special Sections efficient and economical. Mail the coupon for more information.

REPUBLIC STEEL

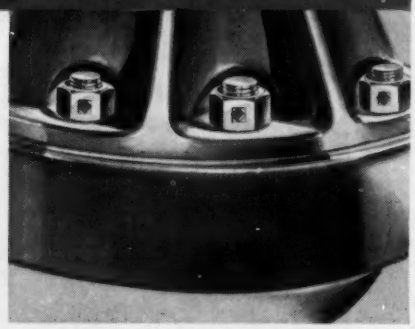
World's Widest Range of Standard Steels and Steel Products

HERE ARE MORE COST-SAVING IDEAS FROM REPUBLIC



SAVE SPACE AND INVENTORY COSTS on steels for tools, like these milling cutters, by using Republic's Tool Steel Warehouse Service. Warehouses in Detroit and Cleveland carry complete stocks of tool steels, automotive die steels, precision-ground flat stock, cold-drawn shank steel. A phone call brings what you need in a hurry, whether it's one piece or a truckload. Questions on steels, dies, heat treating and machining are answered expertly and promptly by our tool steel metallurgists.

HIGH DUCTILITY, PLUS PROVED WEIGHT SAVING, may make you want to know more about Republic High Strength Steels. Their application to various products permits weight reduction up to 25%. And when your product is designed and engineered all the way for high strength steel, weight reduction up to 50% is possible. Republic High Strength Steels are ideally suited for use in structural parts for earth-moving equipment, truck and gasoline trailers, railroad uses. They resist corrosion; extend equipment life by standing up to rough usage.



REPUBLIC "NYLOK" NUTS HELP REDUCE ASSEMBLY COSTS by eliminating lock washers, slotted nuts and cotter keys. Yet they assure positive locking in any position, even under severe vibration. Assembly is speeded, too, because either end of the nut is up. No special tools, lubricants or techniques are needed to start them. "Nylok" Nuts can be backed off for maintenance of equipment and reused. Investigate their use for your product. "Nylok" Nuts are only one of more than 20,000 types and sizes of fasteners made by Republic.

Setting speeds and feeds made as easy as tuning a radio . . . so simple any one can pre-set it.

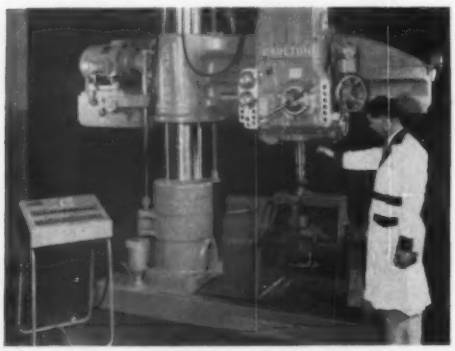
now you can plan and

. . . with the new

Carlton

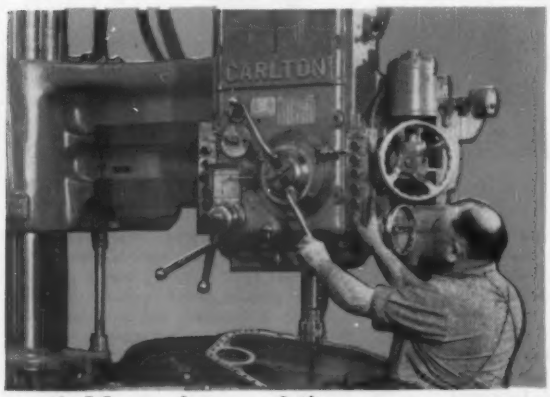
The Carlton Machine Tool Co. announces the introduction of the new Carlton-Leber speed-feed pre-selector and program systems. The two new devices offer faster, and therefore more economical hole drilling production.

Programming Here's how the Carlton-Leber programming works: your production engineering department studies the workpiece drawing and determines the sequence of drilling operations and the correct speed and feed for each. This data is recorded on a routing sheet or blueprint

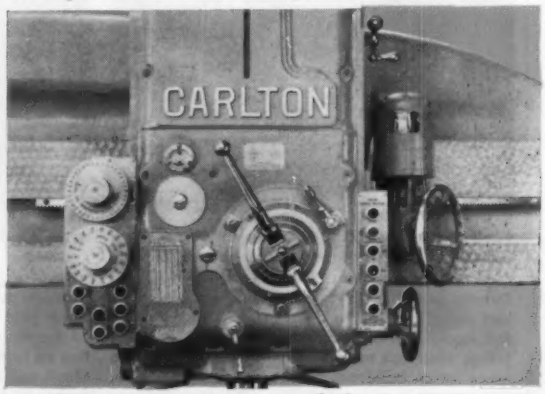


Operator is free to concentrate on starting and stopping spindle, changing cutting tools . . . speeds and feeds have all been pre-set.

Carlton Radial Drills now come with your choice of 3 different



1 ***Manual gear shift:*** 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.



2 ***Pre-select gear shift:*** 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.

pre-set speeds and feeds for an entire drilling program

programming

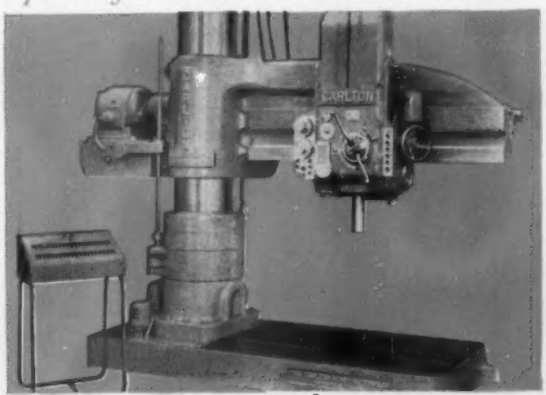
and is transferred to the programming console.

The programming console contains an indexing dial which shows the operation sequence number being performed. Operator has local control and can perform operations out of sequence by manually advancing or reversing the indexing dial.

Pre-selector For less lengthy or complicated drilling jobs, the programming unit can be disconnected through a selector switch and the pre-selector then becomes operative. The pre-selector saves time by allowing operator to select the speed and feed for the next operation while the machine is under cut. Pre-selector may be furnished with or without the programming unit. In fact, you can now buy your Carlton radial drill with your choice of one of three different types of speed-feed control as illustrated below.

Be sure to see the new Carlton-Leber pre-selector and programming devices in action at the Machine Tool Show in Carlton booth 919. In the meantime, write for your descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

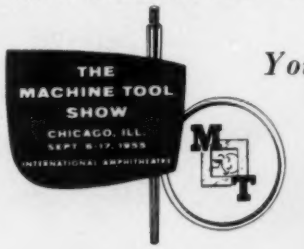
speed-feed controls . . .



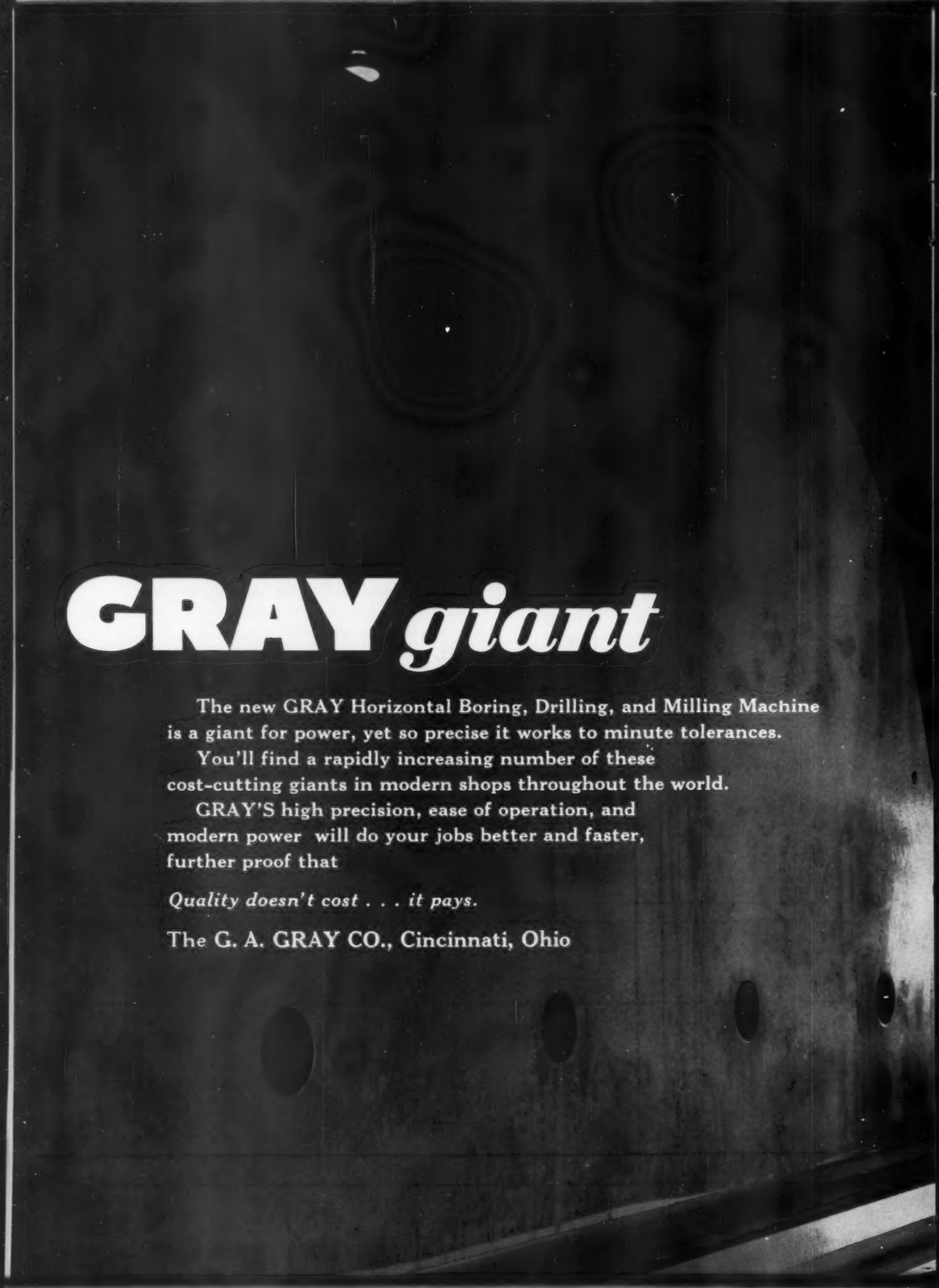
3 ***Pre-selector and programming gear shift*** sets up correct speeds and feeds for a complete sequence of operations.

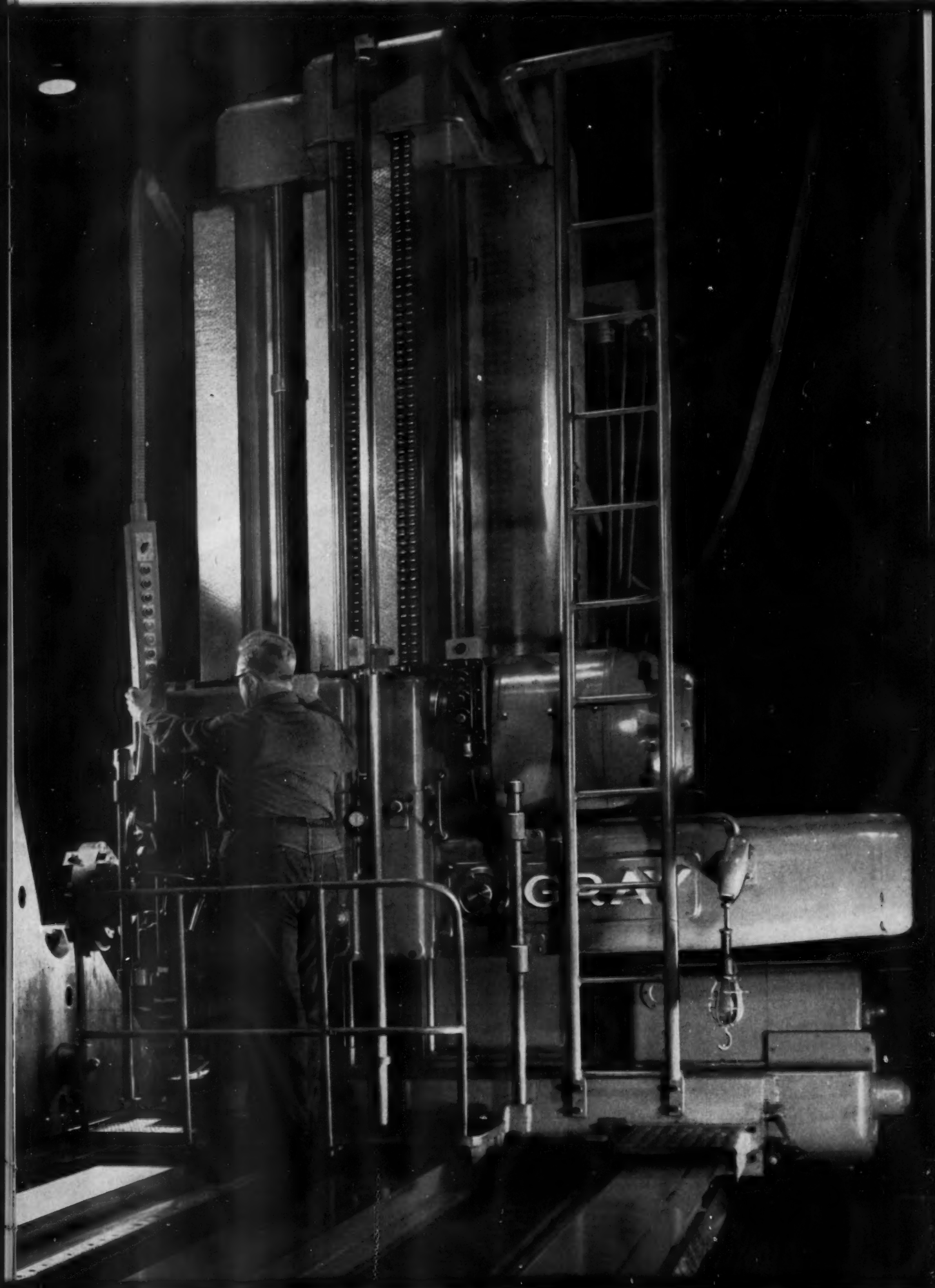
Carlton

horizontal and radial drills



You're invited . . . to see the new Carlton-Leber pre-selector and programming devices. Visit us in booth 919 at the Show.


GRAY giant
The new GRAY Horizontal Boring, Drilling, and Milling Machine is a giant for power, yet so precise it works to minute tolerances.
You'll find a rapidly increasing number of these cost-cutting giants in modern shops throughout the world.
GRAY'S high precision, ease of operation, and modern power will do your jobs better and faster, further proof that
Quality doesn't cost . . . it pays.
The G. A. GRAY CO., Cincinnati, Ohio



Added Evidence that —

Everyone Can Count on VEEDER-ROOT

This Veeder-Root Reset Magnetic Counter (AC or DC) is actuated through electromagnets. And it may be connected in series with any device having a contact arrangement . . . like the specially designed Veeder-Root Electrical Contactor at the left, which insures positive operation of the counter, either in oscillation or connected directly to a revolving shaft . . . with the counter placed at *any* distance from the machine or process on which the count is required.

This is another one of the hundreds of Veeder-Root Standard and Special Counting and Computing Devices developed for every conceivable counting duty, in every field from atomics to electronics.

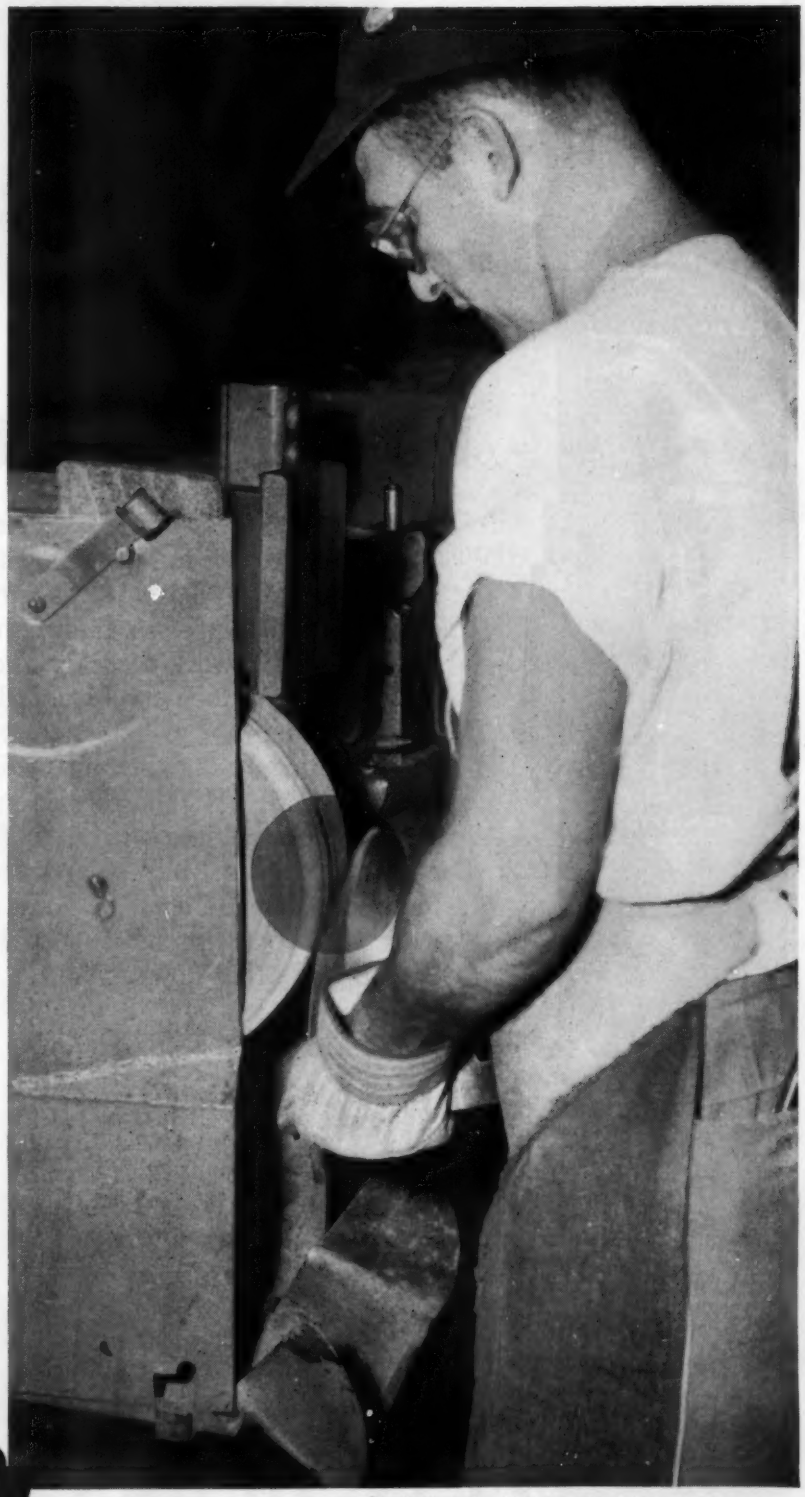
What do *you* need to count? Just write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities
"The Name that Counts"

Put this "Plus" in your polishing

ALUNDUM B abrasive adds the time-saving product-improving "TOUCH of GOLD" to every set-up*



Here are the reasons why ALUNDUM B abrasive in your polishing set-ups will help each wheel last longer, produce more, and polish better:

Excellent cutting action. This development of Norton's famous ALUNDUM abrasive cuts fast, clean and cool — ideal for polishing jobs ranging from roughing to finishing.

Controlled uniformity. Grains are of uniform blocky shape. No flats, slivers or undersized grains to loaf on the job. No oversized grains to mar surfaces.

Maximum adhesion. Norton's special treatment for high capillarity keeps grains from pulling out before each has done its full share of work. Whether you use cement or glue, you get this same firm-clinging action that means longer, more productive wheel life.

Made in all grit sizes, from 20 through 240, to cover the widest range of polishing operations.

Your Norton Distributor

is ready with prompt service on ALUNDUM B polishing abrasive. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

G-289

Making better products... to make your products better

NORTON

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

ARMSTRONG

T-SLOT CLAMP

STEP BLOCK

SET-UP AND HOLD-DOWN TOOLS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

NON-SKID BLOCK

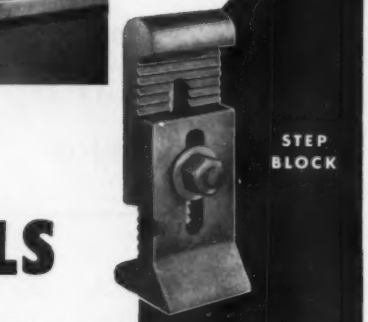
Write for Circular

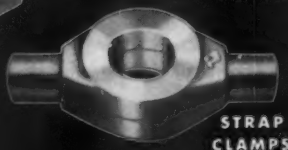
Buy ARMSTRONG TOOLS from your Industrial Distributor

PLANER JACKS

UNIVERSAL CLAMP

T-SLOT BOLTS AND NUTS





STRAP CLAMPS

STRONG

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVE. CHICAGO 30, U. S. A.

Let New Britain engineering supply a new approach

A machine is listed as an asset on your balance sheet, but if it slows your production and makes your costs too high, it's an asset you can't afford.

We invite you to call in your New Britain representative for a new approach to turning out the pieces that affect your profit margins. He has one of the broadest lines in the industry to choose from.

The following four pages contain examples of New Britain's New Approach.

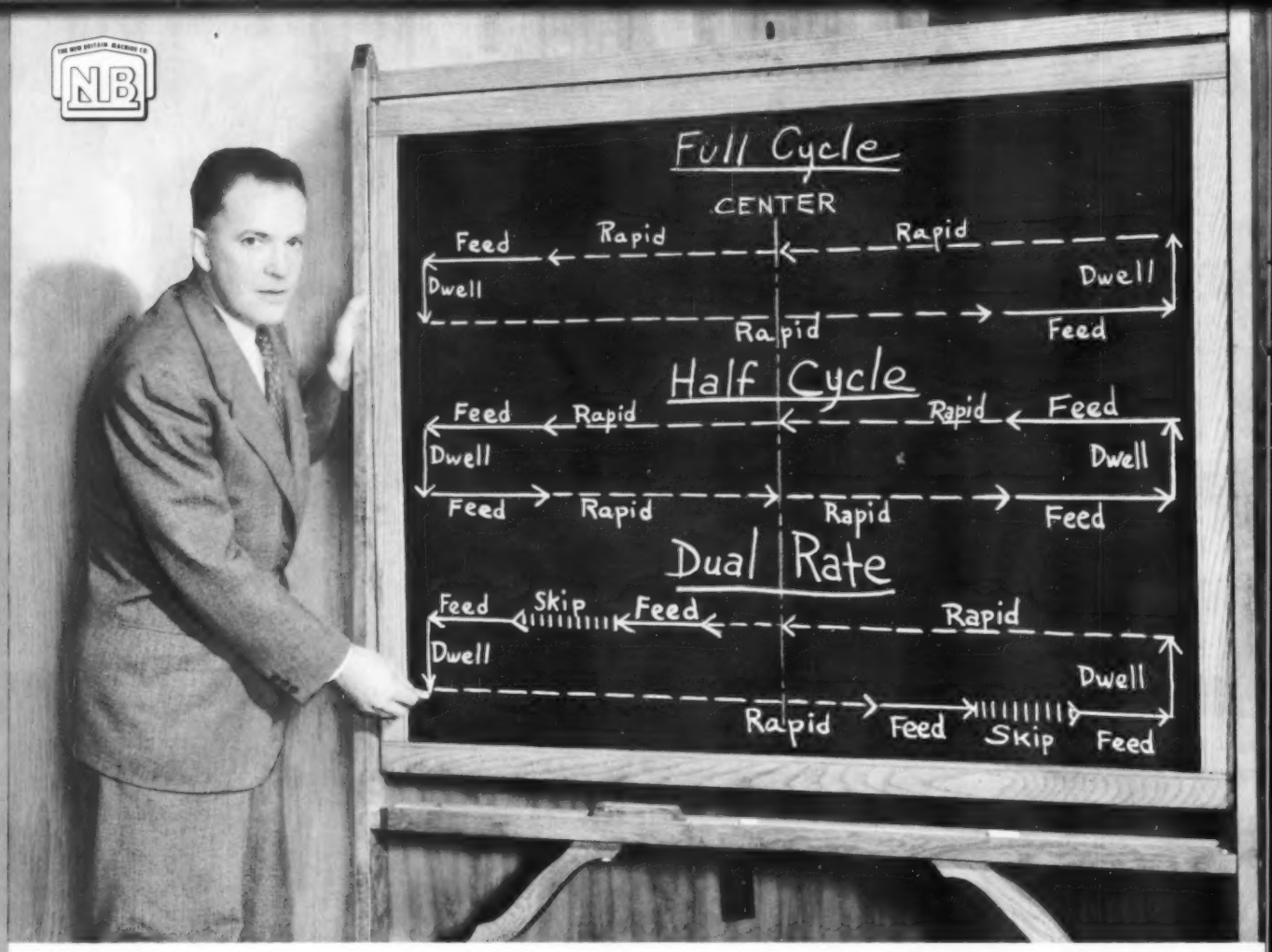
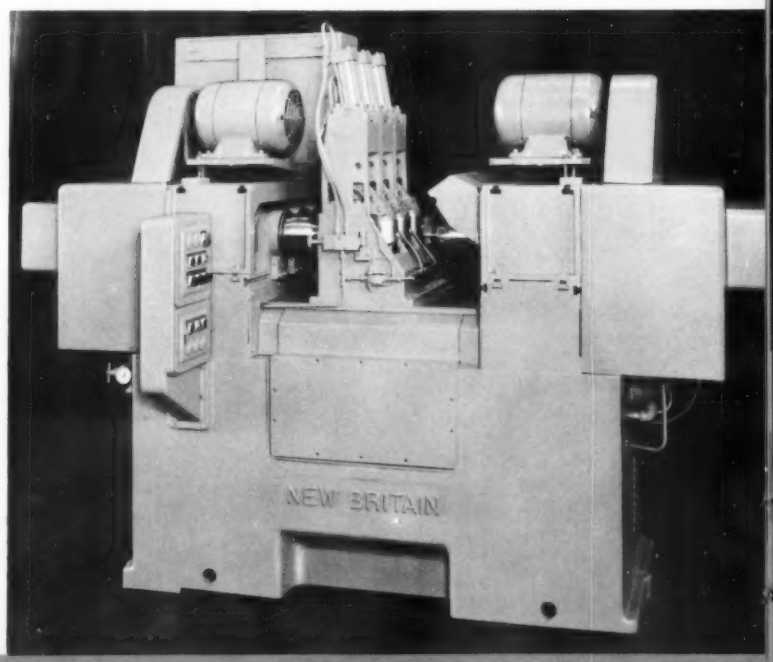


Diagram of versatility

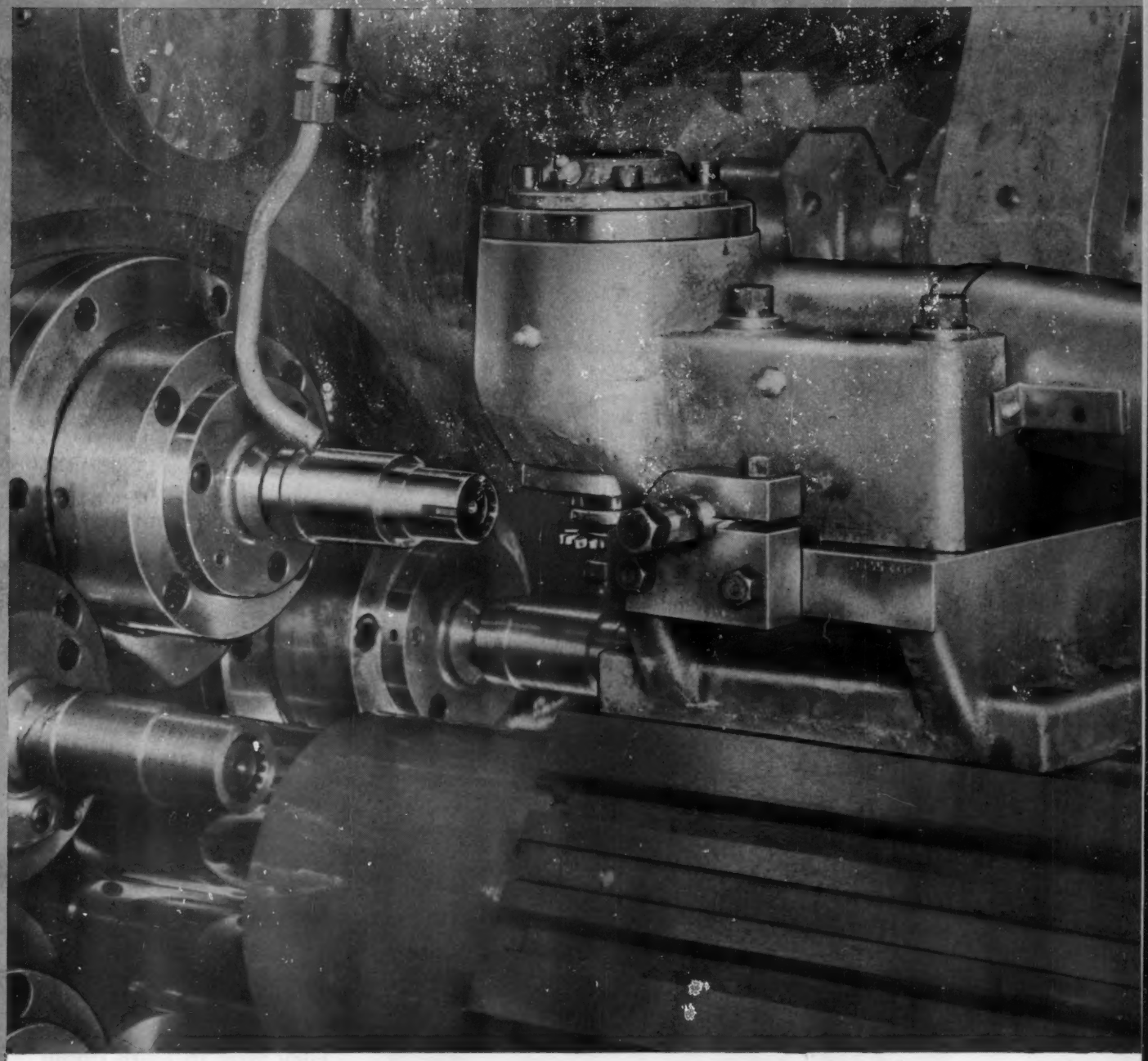
New Britain engineers can show you how to get two pieces per cycle (or double-end production) because of the flexibility of cycling they have designed into our double-end precision boring machines. The blackboard sketches show only three of many set-up possibilities.

FEATURES:

- **Completely separate hydraulic unit outside machine frame**
- **Automatic re-cycling or manual operation**
- **New Britain precision boring spindles**
- **Variable feed during cutting cycles**
- **Special fixtures and work holding devices**
- **One to four spindles at each end**
- **Tool or work rotating**
- **Coolants (optional)**



Model 50 New Britain Double-end Precision Boring Machine



The best machine is only as good as the engineer who tools it

How imaginative tooling can save time and money

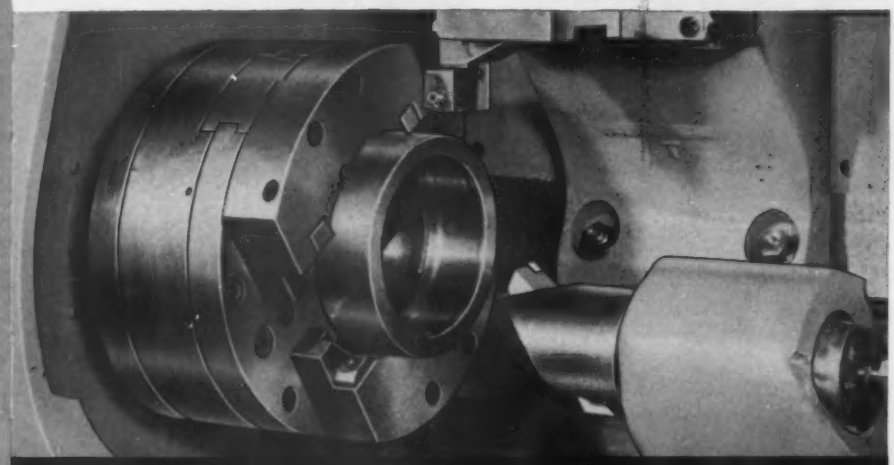
Skillful application of engineering principles to perform secondary operations on one machine can work wonders on *cost-per-piece:* Compare the cost of this milling attachment with the cost of a separate milling machine, *plus operator, plus overhead, plus maintenance, plus transfer time.*

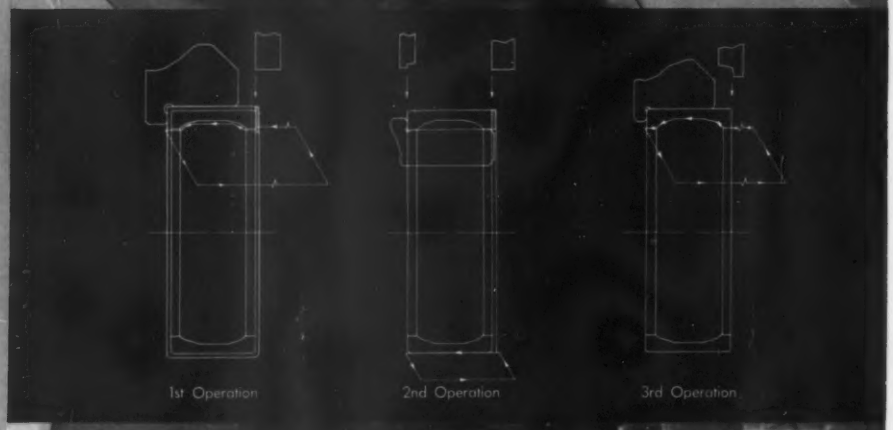
Opportunities like this for lower cost-per-piece exist in almost every plant, if you look for them. New Britain engineers are trained specialists, ready to cooperate in finding better methods.

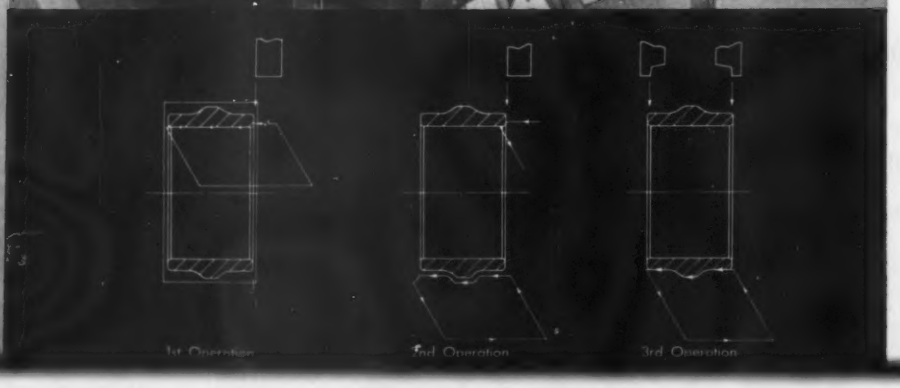
See preceding two pages and two following pages for other New Britain *New's.*

New approach to bearing races

Single point turning on a New Britain +GF+ copying lathe







- Three New Britain +GF+ lathes replace four other machines
- No costly form tools to buy and maintain
- Change-over time reduced 90%
- Total job time cut more than 50%
- Savings quickly pay for new machines

Easy way to learn about the New Britain +GF+ copying lathe

Ask your New Britain representative for a showing of the color motion picture "A NEW APPROACH TO COPY TURNING" in your own plant. Or write The New Britain Machine Co., New Britain, Conn.

The NEW BRITAIN

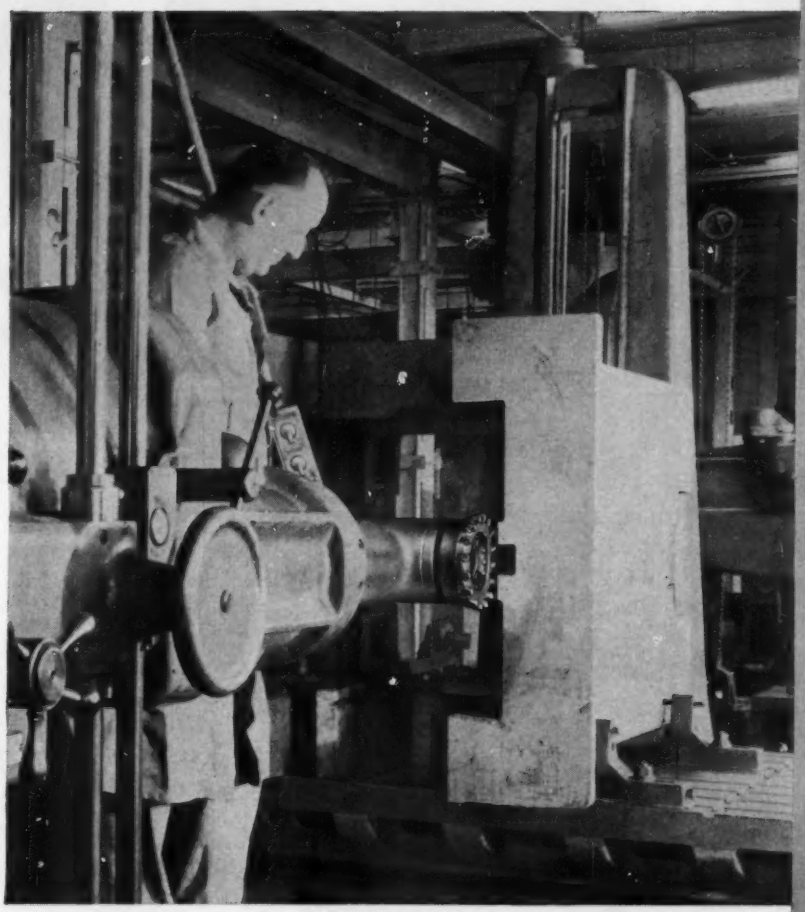
Lucas attachment produces better finish in a fraction of former time

LUCAS OF CLEVELAND

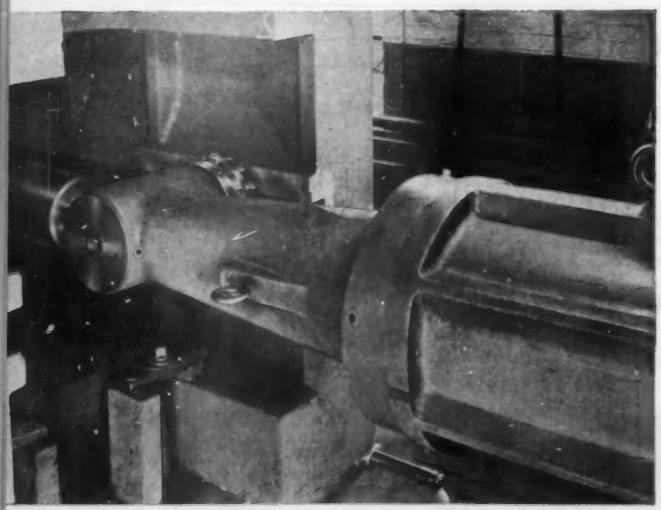
This Lucas Precision Horizontal Boring, Drilling and Milling Machine with angular milling attachment faces two opposing surfaces of this large casting with extreme precision. It machines both sides of the work with a simple 180° repositioning of the cutter — without resetting the job, or loss of accuracy.

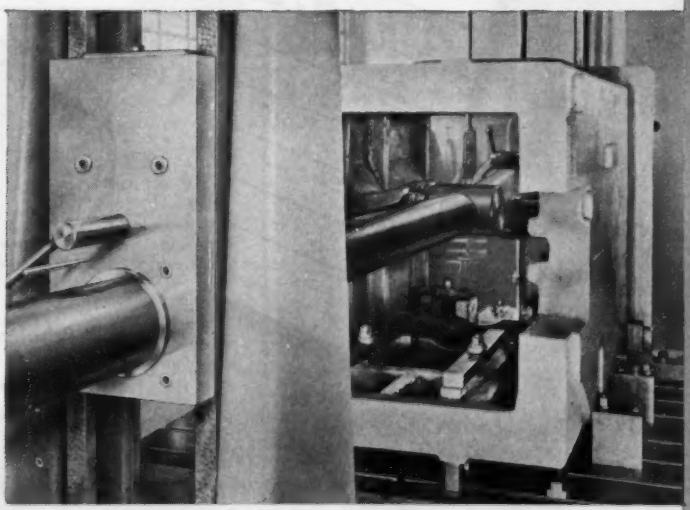
Performing these fine finish operations with the cutter over *four* feet away from the front bearings of the machine is an extreme test, but there is no chatter, and this job has been running for four years to the manufacturer's complete satisfaction.

Ask your Lucas representative for help on the jobs other horizontal boring mills can't handle.



LUCAS MACHINE DIVISION
The New Britain
Machine Company
Cleveland 8, Ohio





• AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
• LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES • NEW BRITAIN +GF+ COPYING LATHES

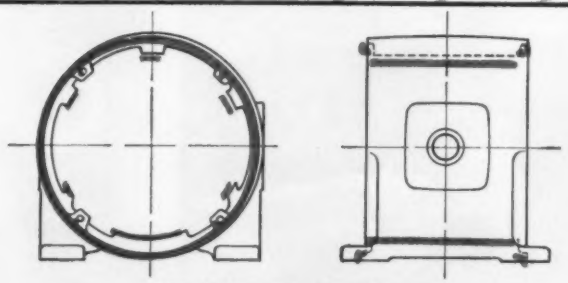
MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut
Lucas Machine Division, Cleveland 8, Ohio

See the preceding four pages for other New Britain New's.

PROBLEM

1. lower stator frame machining costs.
2. increase production and accuracy
3. run any one of four different size parts



MACHINING NECESSARY

Drill 8 holes	Bore two inside diameters
Chamfer 8 holes	Rough face ends
Tap 8 holes	Remove chips

for problems in Drilling, Boring, Facing and Tapping

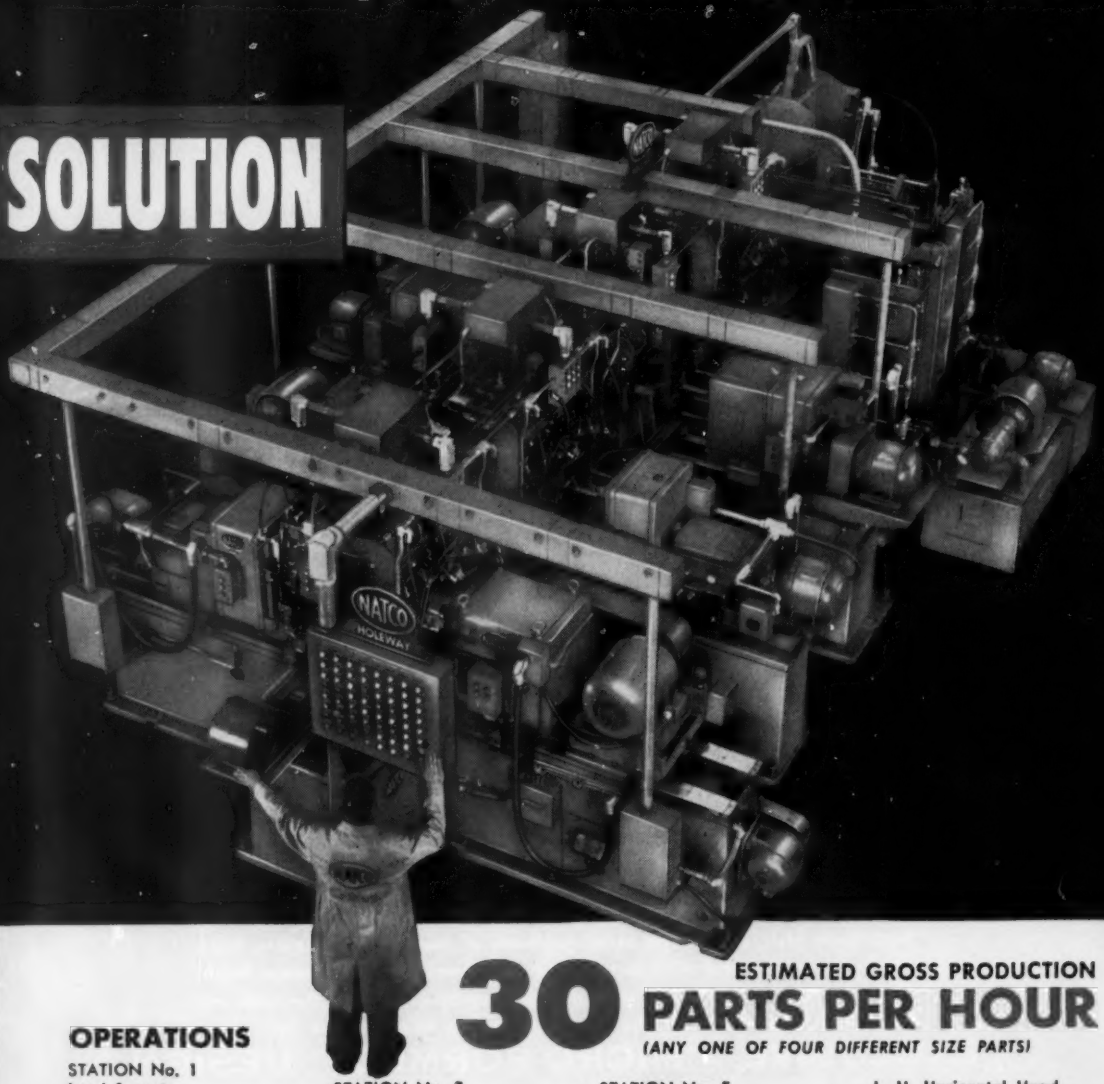
Call a Natco Field Engineer

CHICAGO, Room 203, 6429 W. North Ave., Oak Park
DETROIT, 10138 W. McNichols Rd. • BUFFALO, 1807 Elmwood Ave.
NEW YORK, 35 Beechwood Ave., Mount Vernon

NEW NATCO HOLEWAY

cuts costs and increases production . . . and accuracy by combining operations!

SOLUTION



30 ESTIMATED GROSS PRODUCTION
PARTS PER HOUR
(ANY ONE OF FOUR DIFFERENT SIZE PARTS)

OPERATIONS

STATION No. 1
Load 1 part.
STATION No. 2
R. H. Horizontal Head
Combination rough bore for 10.492/10.490 half thru, rough bore for 12.064/-12.062 diameter, finish bore 10.520/10.510 diameter and rough face end.
L. H. Horizontal Head
Drill 4 holes

STATION No. 3
Idle
STATION No. 4
R. H. Horizontal Head
Drill 4 holes
L. H. Horizontal Head
Combination rough bore for 10.492/10.490 diameter rough bore for 12.064/12.-062 diameter and rough face end.

STATION No. 5
Idle
STATION No. 6
R. H. Horizontal Head
Tap 4 holes
L. H. Horizontal Head
Tap 4 holes
STATION No. 7
Idle
STATION No. 8
R. H. Horizontal Head
Idle

L. H. Horizontal Head
Finish bore to 10.492/10.490 diameter thru.
STATION No. 9
Blow chips out of center bore and 8 tapped holes (4 each side) and blow chips off top.
STATION No. 10
Unload 1 part. Part to be unloaded onto gravity conveyor.

NATIONAL AUTOMATIC TOOL COMPANY, INC.

RICHMOND, INDIANA

NATCO

WADELL MICRO-FORMED END MILLS

FAR AHEAD IN EVERY WAY

Wadell Tools recent entrance into the End Mill field affords Wadell the great advantage of selecting the most modern equipment and techniques available. This advantage plus invented elements adds up to superior "MICRO-FORMED" End Mills.

GROUND FROM THE SOLID

Wadell Tools End Mills are ground from the solid on the Wadell "Micro-Formatic" Grinding Machines. The development of these machines were the result of a program requiring years of research. The invented principle used, provides means to produce ground from the solid end mills having a cross sectional steel grain structure of perfect uniformity.

ADVANCED HEAT TREATING

The Wadell factory represents a concentrated effort dedicated to the single purpose of producing premium quality end mills. Consequently, such an operation has the advantage of selecting the most advanced heat treating equipment and extreme accuracy of modern electronic controls.

SUPERIOR UNIFORMITY

Visual examination will immediately convince the experienced tool man that a "Micro-Formed" End Mill represents perfection in such cutting tools. Each given style cutter is an exact duplicate of another. The surface finish produced on the end mills measures in the lowest range of micro finish. Flute spacing is accurate to a tenth of a thousandth of an inch, the hook and relief retains its exact form for the entire cutting length of the flute.

EXCLUSIVE "MICRO-FORMED" DESIGN

All sections of each End Mill, such as the curve of the hook, shape of the flute, width and depth of the bead have been perfected by painstaking effort. The ends are machine ground and retain the same amount of accuracy and uniformity as the flutes, the end grind is a radial relief.

*patent applied for

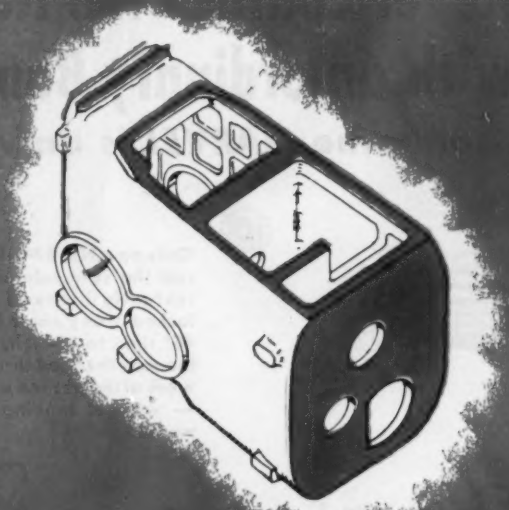
WT **WADELL TOOLS**

P. O. BOX 97 • RARITAN, N. J.

EXCLUSIVE TERRITORIES AVAILABLE TO STOCKING DISTRIBUTORS

CUSTOMER SPECIFIED

One of the nation's famous-name farm machinery manufacturers required a big, high-speed, precision production milling machine which would mill several surfaces on huge, 625-lb. transmission case castings in a single setup.

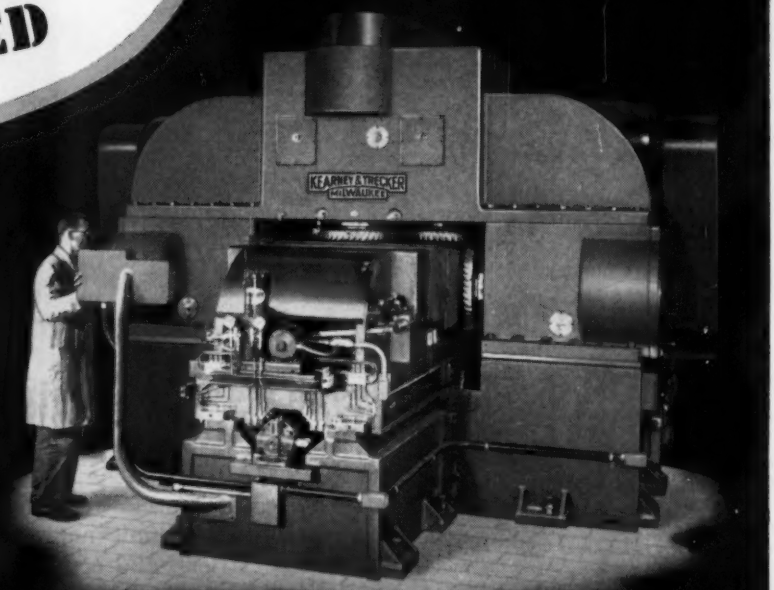


Green indicates machined surfaces on tractor transmission case.

KEARNEY & TRECKER MILWAUKEE DESIGNED

Kearney & Trecker's proposal was accepted and the result was this 44-ton, Five-Spindle Triplex machine which mills top, front and rear surfaces of tractor transmission cases at a rate of 23 pieces per hour.

Two horizontal spindles are mounted in duplex fashion and three vertical spindles on the massive bridge type head. Horizontal spindles, driven by 40-hp motors, carry 22" dia. cutters with 44 blades. Powered by a 50-hp motor, two of the vertical spindles have 22" dia. cutters and the third spindle a 6" dia. cutter with 12 tungsten-carbide blades.



New production efficiency starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

For more details on machine illustrated ask for Data Sheet No. 1062. Booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.

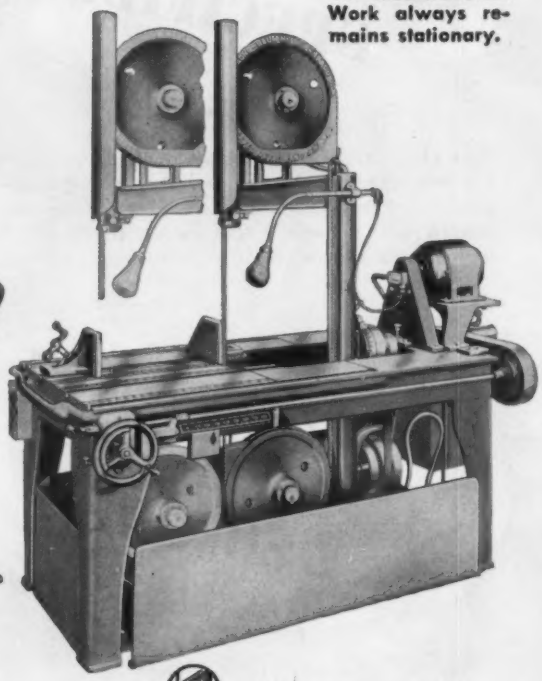
Builders of Precision and Production Machine Tools Since 1898

Never Confuse the No. 8 MARVEL with an ordinary Band Saw

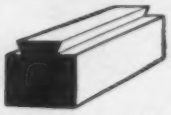
...only the MARVEL is Universal

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.

Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.



Only a No. 8 MARVEL can do all of these things: Snip-off a ⅛" rod or cut-off an 18" x 18" cross section

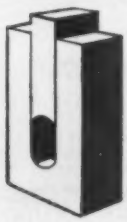


Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams.



Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

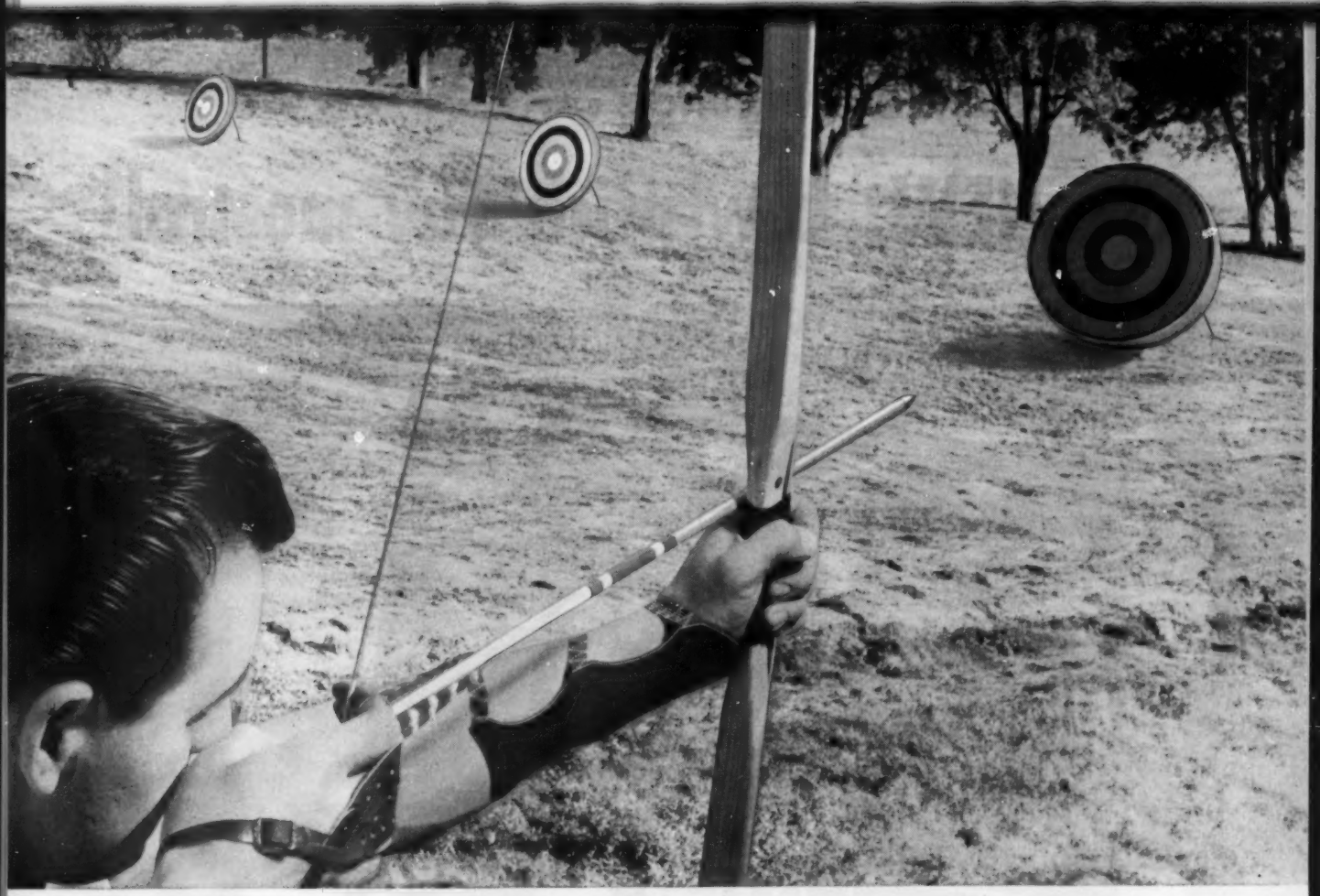
The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.



How to have 2 strings to your bow...

...SWITCH TO CIMCOOL°, the radically new and different coolant that has become, in a few years, the largest selling chemical-lubricant cutting fluid in the world. Here are two big advantages of CIMCOOL Standard Concentrate over old-fashioned cutting fluids:

CIMCOOL DOES A BETTER JOB because of its chemical lubricity. It permits faster speeds and increases tool life, for it combines friction reduction and cooling capacity in a degree never before attained.

CIMCOOL LOWERS COSTS because it lasts longer in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.

For information on the many specific advantages of CIMCOOL Standard Concentrate—or details on the entire family of CIMCOOL Cutting Fluids—just contact us. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

- CIMCOOL **Standard Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs.
- CIMCOOL **5-2 Concentrate**— For heavy duty use.
- CIMCOOL **Water Conditioner**—For increased rust control.
- CIMCOOL **Tapping Compound**—Increases tap life amazingly.
- CIMCOOL **Transparent Grinding Fluid** — Superior rust control at high dilutions.
- CIMCUT **Base Additive** — For jobs requiring an oil-base coolant.
- CIMCOOL **"CI"**—The cutting fluid for cast iron with exceptional rust control properties.
- CIMCOOL **Machine Cleaner**—The 2-phase non-corrosive cleaner that cuts grit, dirt, slime and oil.
- CIMCOOL **Bactericide**—The most effective agent yet developed to overcome rancidity.

CIMCOOL Cutting Fluids

100% for ~~85%~~ of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

GENERAL ELECTRIC ANNOUNCES . . .

NEW, Low-price Thy-mo-trol*

Printed Circuits—or "wireless" circuitry—constitute the "brains" of the new general purpose Thy-mo-trol Drives. Simply, it is a method of printing an electrical diagram on the back of a sturdy, lightweight plastic board. The electrical "track" or diagram is made of solder-covered copper strips.

All circuit components within the "brain" are connected without the use of wiring! A protective coating is sprayed over the entire printed circuit. All connections to the control circuits are of the simple "plug-in" type, making attachment and removal of connecting circuits a simple, hand operation.

"Brain" of new Thy-mo-trol Drive—printed control circuits. Top photo shows printed electrical diagram. G.E.'s industrial adaptation of this process helps reduce size and complexity of circuits. In lower photo, new at left, conventional at right.

Drive with Printed Control Circuits

NOW! GET RELIABLE, SMOOTH, ADJUSTABLE SPEED FOR MACHINE TOOLS IN A SIMPLIFIED, LOW-PRICED DESIGN

Designed for quality performance, reliable operation, easy maintenance, and at a new low price, a new and simplified line of general purpose Thy-mo-trol Drives has been developed by General Electric. These drives represent a new and far-reaching step in electronic adjustable speed.

An approximate 20% price reduction under the line it replaces is possible because G-E has successfully simplified the entire control system and has adapted printed control circuits into the Thy-mo-trol panels. New Thy-mo-trol design allows a substantial reduction in *weight, size, circuit complexity, wiring, maintenance costs and installation cost.* The new design is now available in two ratings: ¾ to 1 hp and 1½ to 3 hp—making your choice of an adjustable speed drive to meet specific needs that much easier.

Operating directly from a-c power, the new standard Thy-mo-trol Drive includes an electronic control panel, a d-c motor, and a pushbutton station. No anode transformer is necessary if operated on 440 volts, 50 or 60 cycle, single phase power. Separately mounted auto-transformers are supplied as a standard feature for voltages other than 440.

The new drive is rated at constant torque over the entire speed range. Speed range is 8 to 1 for continuous duty with higher ranges possible for special applications. Optional modifications include jogging, reversing, tachometer feedback, reactor loop control, and external current limit adjustment.

For more information on this outstanding new adjustable speed drive, contact your nearest G-E Apparatus Sales Office or write for Bulletin GEA-6234, General Electric Company, Section 791-1, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

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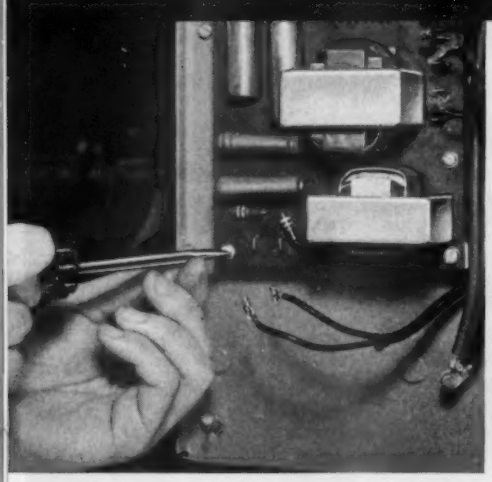
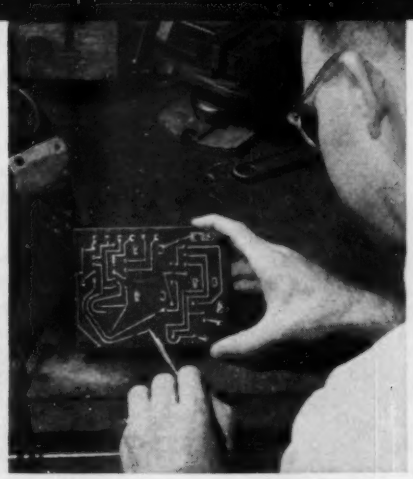


Easily attached or removed. Only a screwdriver is needed. Plugs and terminals are numbered for easier service.



Simplified repair. Component replacement is fast and easy—a simple bench operation. No need to discard entire unit.

Three basic units. DC motor, pushbutton station, and panel containing tubes and "brain" make up new Thy-mo-trol Drive.

Eliminates model change-over problems!

a special production machine—with standard units . . . quick change-over features for each year's design change. completely automatic—requires only part loading and unloading.

Morris Unit-Type Machine Tools provide truly specialized machining of your product . . . using standard production components . . . add flexibility to your high-speed mass production operations. They may also be re-aligned and additional drill units added for model alterations, or for complete new models, without scrapping the machine.

For example, the Morris MOR-SPEED production machine illustrated, drills, burrs, reams, taps and spotfaces carburetor air horns at the rate of 375 pieces per hour at 80% efficiency!

Its standard basic construction provides a stationary circular center column with Morris AIR-OIL-MATIC Drill Units mounted on the column and on the removable platen for station operations. Parts are placed in air-power clamped fixture by the operator. The table indexes automatically through 12 stations, controlled by hydraulic indexing mechanism. 24 operations on 21 holes on 4 perpendicular faces and one angular face are performed on each piece. Operator merely loads unfinished pieces, unloads completed parts. Cams on center column automatically index and position fixtures at each station.

Morris AIR-OIL-MATIC Drill Units, mounted in vertical, horizontal or angular planes at the stations, provide accurate high-speed machining.

Easy Maintenance

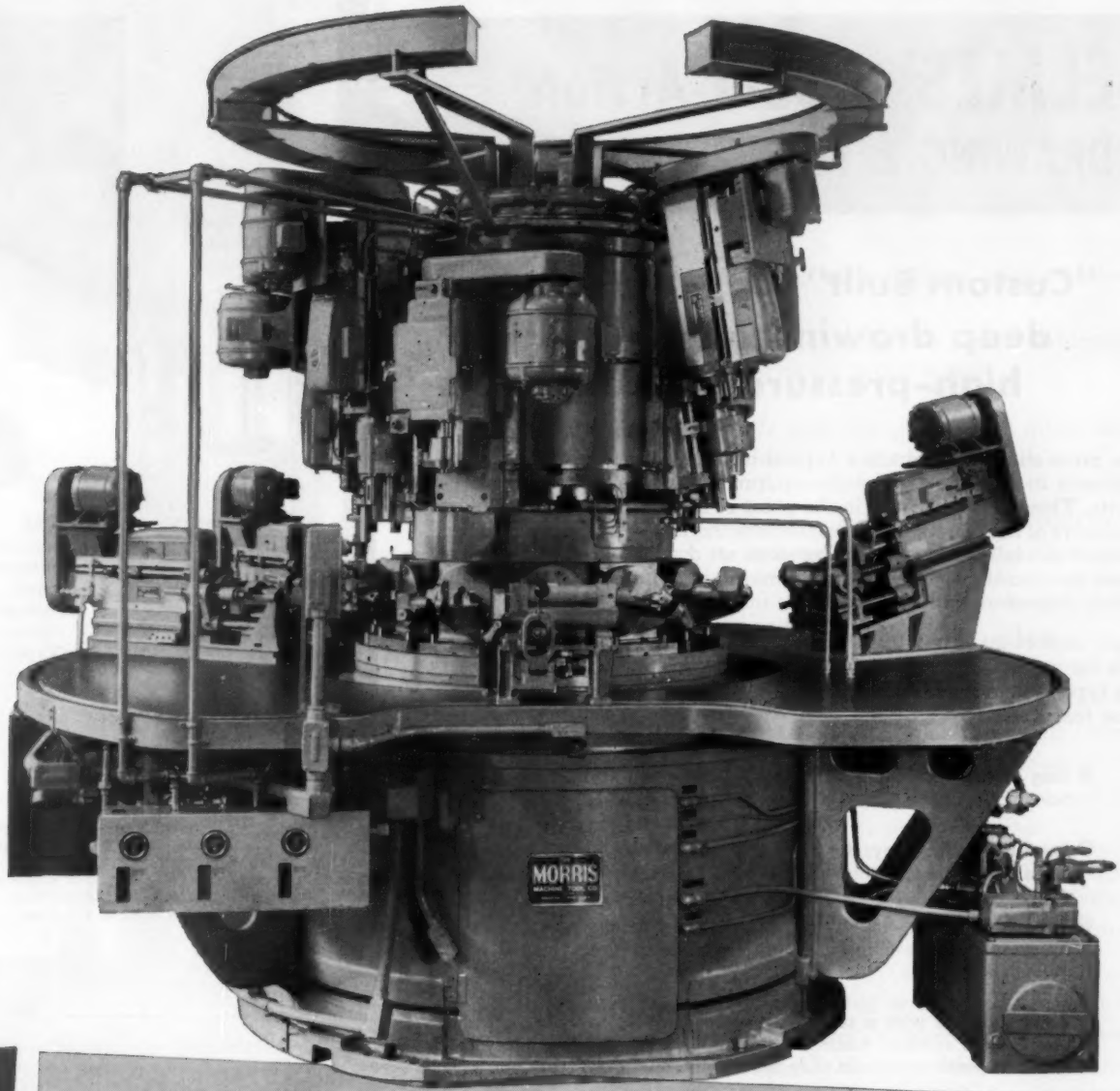
Each drill unit is provided with independent feed and speed, permits adjustment of individual units without affecting entire machine. Standard units, stock parts, speed machine maintenance. Operational difficulties may be pin-pointed, given prompt attention.

MORRIS AIR - OIL - MATIC DRILL UNITS

• Adjustable Feed, Stroke and Rapid Approach • Trouble-free Hydraulic System
• Wide Range of Spindle Speeds • Convenient Controls
• Air or Oil Powered • Hydraulically Controlled

A powerful package of precise versatility, developed by Morris, one of the nation's leading manufacturers of high production drilling machinery. Available for use in special purpose machines like the production machine illustrated.

AIR OR OIL POWERED — HYDRAULICALLY CONTROLLED! Designed for a wide range of drilling, reaming, chamfering, spot-facing, hollow milling, centering and related operations, the unit can be mounted in vertical, angular or horizontal positions. The Morris AIR-OIL-MATIC Drill Unit has adjustable feed rate, feed stroke and total stroke. Controls and actuating devices can be set to provide almost any sequence of operations.



You'll want to know how MORRIS Unit Type Machine Tools, MORRIS AIR-OIL-MATIC Drill Units can be applied to solve your mass production involving multiple drilling, reaming, tapping and boring.

Write for detailed descriptive literature . . . or outline your production problem for prompt attention by Morris engineers.

THE MACHINE TOOL SHOW

MT

VISIT US AT BOOTH #912
THE MACHINE TOOL SHOW
Chicago, Illinois, Sept. 6-17, 1955
International Amphitheater

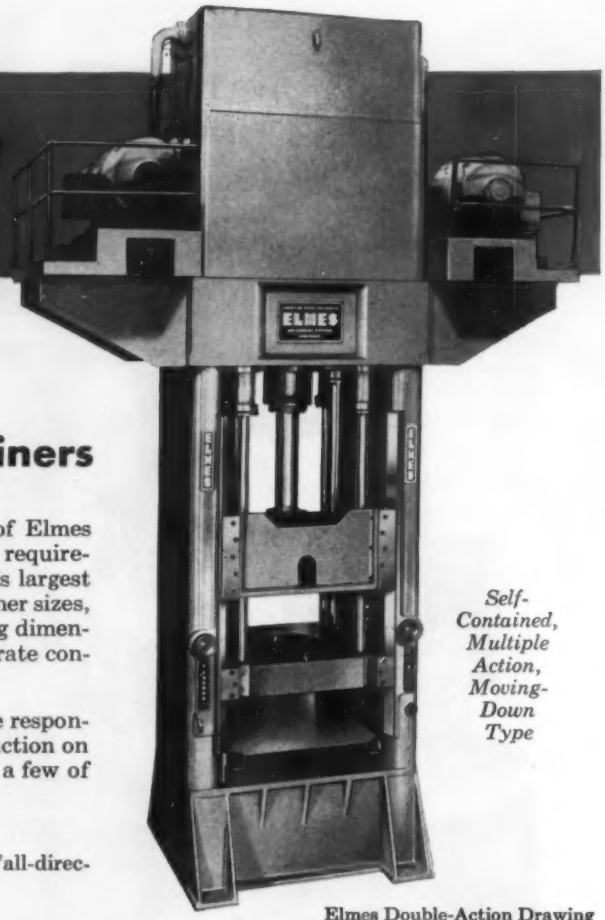
Builders of MOR-SPEED Line

Morris

THE MORRIS MACHINE TOOL CO.

933 HARRIET STREET . CINCINNATI 3, OHIO

ELMES *Double-Action* DRAWING & FORMING PRESS



Self-Contained, Multiple Action, Moving-Down Type

"Custom Built" for deep drawing of large high-pressure gas containers

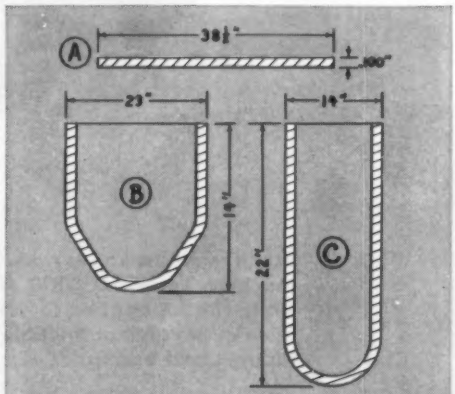
The press shown at right is a typical example of the work of Elmes engineers in designing hydraulic equipment to meet special requirements. This press is located in the plant of one of the nation's largest producers of high-pressure gas containers. A variety of container sizes, made of special high strength alloy steel, are drawn to exacting dimensional specifications. The press must maintain uniformly accurate concentric diameters and wall thickness in the part.

Many important Elmes construction and control features are responsible for maintaining the high quality and efficiency of production on this type of heavy-piece, deep-draw work. Following are just a few of these features:

- **Ring key positioning,** assuring constantly maintained "all-directional" alignment of press crown, bed, and housings.
- **Extra-long guide ways for main and blankholder slide,** counteracting all tendency of the slide to deflect during pressing operation.
- **Provision for extra-fine gib adjustment and slide alignment** obtained by use of non-metallic facing on the gibs and hand-scraped bearing surfaces.
- **Press equipped with a separate pumping unit** for powering the blankholder system. Assures maintenance of the blankholder pressure irrespective of main slide movement.
- **Individual corner pressure adjustment** provided for blankholder slide.

Elmes craftsmanship in press design and construction will assure *you* of press performance at its *best.* Recommendations and cost estimates will be promptly supplied, and entirely without obligation, of course. See your authorized Elmes Distributor, or write to us direct.

Elmes Double-Action Drawing & Forming Press, equipped with die cushion. Main platen capacity 300 tons, blankholder capacity 100 tons. For single-action operations of main platen and blankholder, capacities are combined for a total of 400 tons.



Cross-section views showing stages in production of high-pressure gas container bodies on the Elmes Double-Action Press illustrated above. The blank and first draw are produced in a single operation. (A) Circular blank. (B) First draw. (C) Final draw.

THE MACHINE TOOL SHOW
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METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

For Fast Set Up and Positive Accuracy

Use the *DIMENSIONAIR*

TRY THE DIMENSIONAIR . . . and see for yourself its superior features.

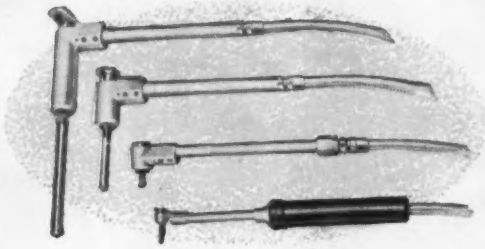
Set in *less than ten seconds* — no time wasted balancing air pressures.

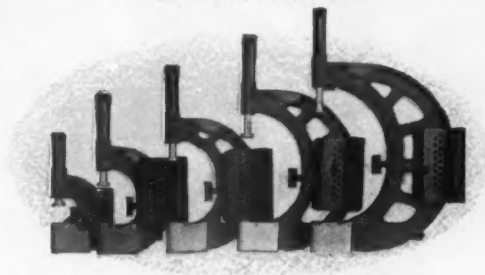
The only air gage made to a definite predetermined accuracy.

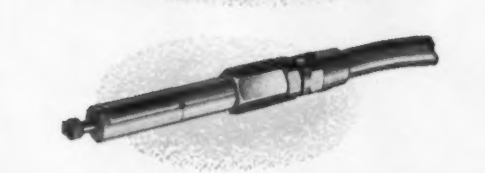
The only air gage accurate enough to have a calibrated scale. That's why it can be set to one master.

Its calibration is *built into* the gage. You don't read approximate graduations between tolerances.

Don't take our word for it—or anybody's—take your own. Try it, compare it, and use it. Ask us for a chance to operate one.







Dimensionair Accessories also have outstanding advantages

ADJUSTABLE AIR BORE GAGES. Only four gages will inspect all holes from ½" to 8". Precision-made centralizer locates measuring contacts on hole diameter. Light, well balanced, and not influenced by temperature variations due to handling.

ADJUSTABLE AIR SNAPS. Five sizes provide a combined range of 0" to 6". Light. Quick to set to size. Frictionless, sensitive and positive contact. Adjustability is fast and convenient on short runs of various sized parts.

AIRPROBE. Increases the versatility of air gaging. Use it on special gage set ups, multiple gages and where inaccessible places make more conventional gages difficult to use. Actual calibrated readings make tolerance setting masters unnecessary. Longer actual measuring range. Easier to set.

ARNOLDAIR. Simple Attachment for Arnold Grinding Gage "smooths out" the minute bumps and makes more positive dial reading. Makes possible greater uniformity in grinding all workpieces within .0001". Relieves strain on the machine operator: He *sees* how work is proceeding and can adjust wheel feed to avoid producing scrap.

AUTOMATIC GAGING AND MACHINE CONTROL. The advantages of air gaging are also applied to automatic dimensional sorting, and dimensional control of machine tools. Air gaging also maintains the dimensional accuracy of workpieces at various stages of in-process manufacturing and provides final dimensional quality.

Write us about anything you require in special attachments. Get up-to-date on the Dimensionair: find out for yourself why those who own Dimensionairs say there is no comparison. Our new catalog 54D tells the whole story. Ask for your copy.

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FOR ANYTHING IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

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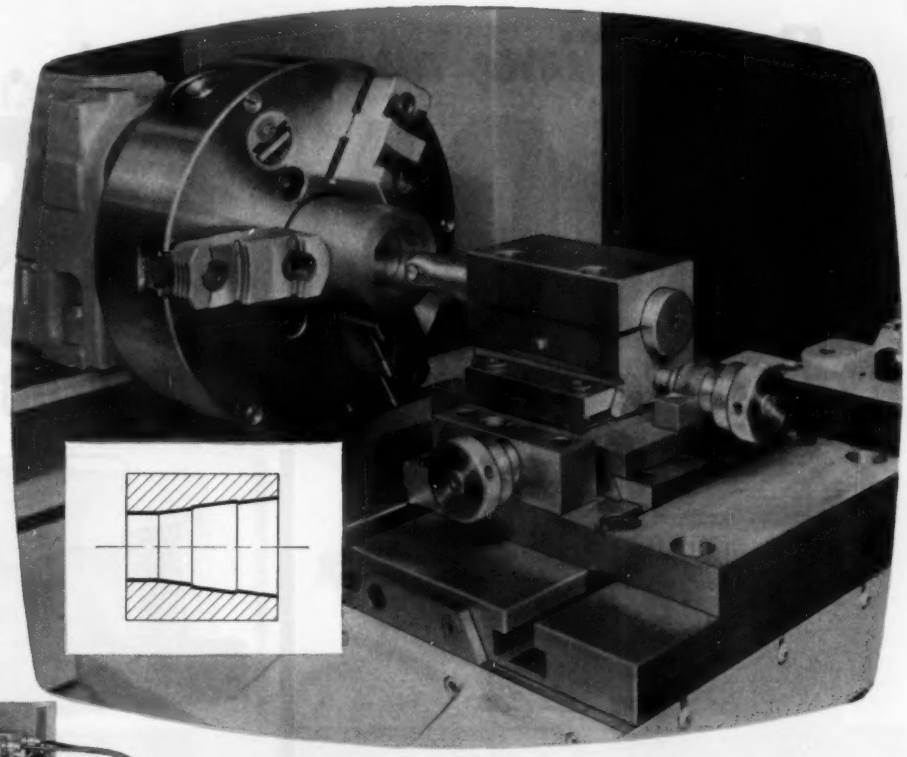
WHY USE A PLATED UNBRAKO SOCKET SCREW? Accuracy of the plated screw —Class 3A thread tolerance after plating. And prompt delivery—shipment of plated UNBRAKOS 7 days after receipt of your order. It is this unique control of quality and delivery that enables us to supply plated UNBRAKO socket head cap screws for this precision centrifugal separator used in the dairy industry. The story of plating at SPS is told in an interesting booklet, "Precision Plating—a product and a service." For a copy, see your authorized industrial distributor or write us on your business letterhead. STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

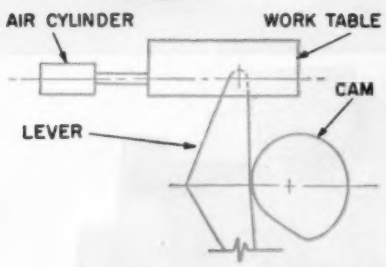
UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

Get precision boring results like this...



...on the BRYANT precision boring machine!

Part—Chuck body, A. I. S. I. 8747 steel, 18 to 20 Rockwell "C"
Operation—Combined taper and straight boring
Hole dimensions—1.875 + .005 at large end, 8° taper, 3" long
Cutting speed—1500 R. P. M., 475 to 725 S. F. M.
Feed—6 I. P. M., Lead: .004
Finish Required—40 to 60 micro-inches
Production—63 pieces per hour at 100%



Be sure to see Bryant at the Machine Tool Show ***Booth 1015***

This Bryant Boring Machine is ideal for precision boring. Its many proven features ensure uniform fine finishes and utmost accuracy... at peak production rates. And you can get these results in precision drilling, turning, facing, grooving and contour boring and turning... as well as precision boring.

The Bryant 998 has basic, rigid machine design. The table is actuated mechanically by a precision cam and lever unit. This feature provides positive control of the cycle at all times. It also eliminates variation due to temperature change of a hydraulic system. Fine finishes are assured by the smooth, uniform table motion. The table moves on two 4"-diameter solid steel slide bars firmly bolted to the bed. Two anti-friction, pre-loaded ball bearings on each of these bars support the table. This construction provides a metal-to-metal contact which eliminates shifting due to oil film. *Write for Bryant 998 Job Folder.*

BRYANT

chucking grinder co.

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Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

Save Time and Money ... Select

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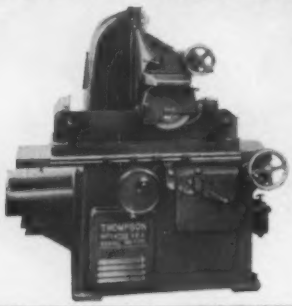
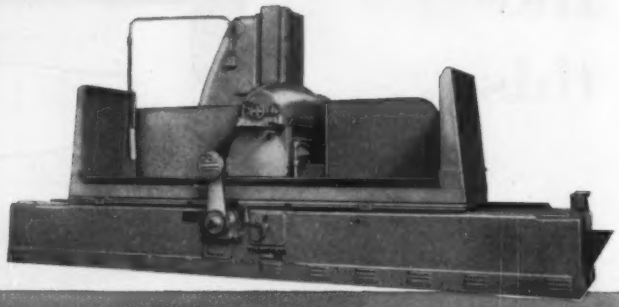
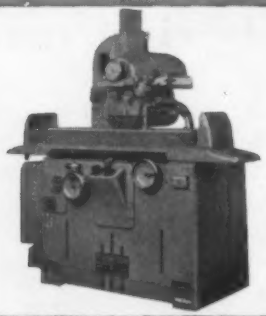
HYDRAULIC SURFACE AND CONTOUR GRINDERS



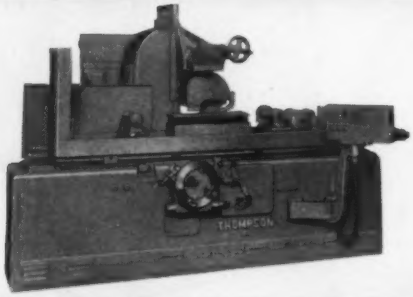
TYPE B Small General Purpose Grinders sizes from 6x12x18 to 12x12x120



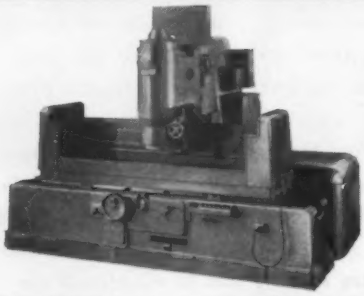
TYPE C & CX Medium and Heavy Duty Grinders sizes from 12x16x40 to 36x36x240



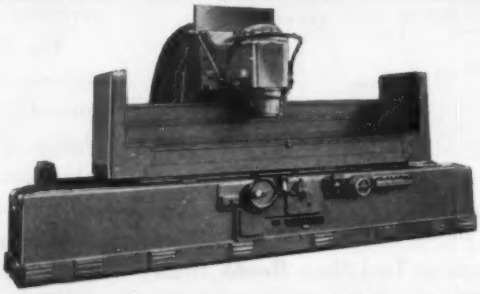
TYPE F Tool Room Grinders available in sizes 6x10x18 and 8x18x24



TYPE B & C TRUFORM Contour Grinders for all shapes sizes 10x12x20 to 14x16x36



FIXED COLUMN VERTICAL SPINDLE Production Surface Grinders sizes 12x18x36 to 28x24x120



SLIDING COLUMN VERTICAL HYDROVERT For obstructed or multi-level surfaces sizes 16x24x48 to 48x24x192

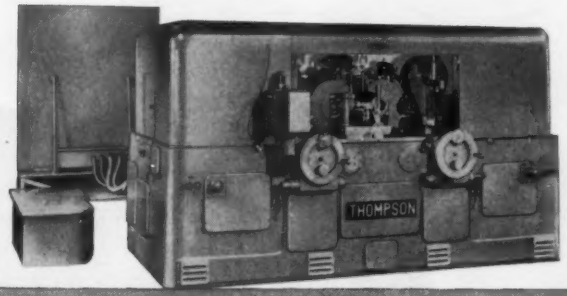
Write Thompson today for details . . .

1 **WIDEST RANGE** of light and heavy duty Surface and Contour Grinders

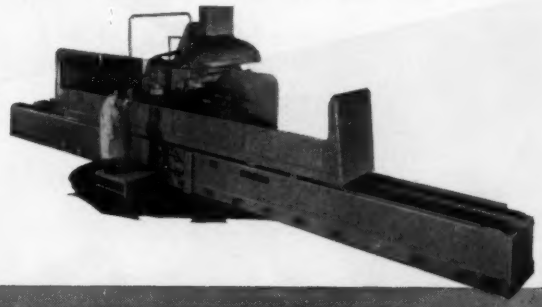
2 **HIGHEST ACCURACY** for lower costs

3 **PROVED QUALITY** for longer service

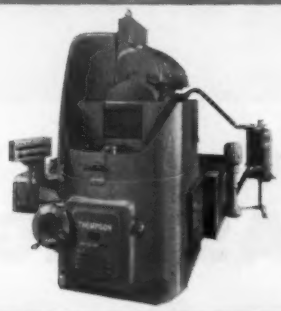
4 **SPECIAL MACHINES** for any surface and contour grinding application



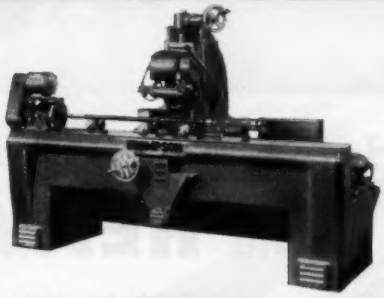
DOUBLE WHEEL BUCKET AND BLADE GRINDER for jet aircraft



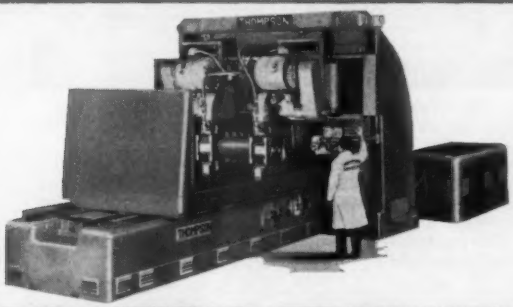
WAY GRINDERS Many sizes and types from 18x11x48 to 50x50x240



TWIN CHUCK ROTARY GRINDER For grinding circular metal discs 6 to 12 inch and 6 to 16 inch sizes



NEW SERIES 600 MANUAL BROACH GRINDER sizes 6x42 to 6x84



RAIL TYPE HYDRAIL Widest grinder ever built sizes 48x36x96 to 72x36x240

Thompson SURFACE Grinders

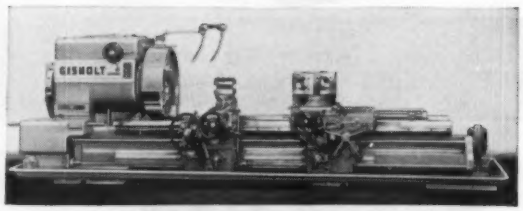
The Thompson Grinder Co., Springfield 1, Ohio

"Here's why GISHOLT insists upon the HEAVIEST CASTINGS!"

Look at them . . . castings for the heaviest saddle type turret lathes in the business! Look at all the angles:

First, note how the headstock is cast integrally with the bed for perfect spindle alignment . . . how cross supports give the most solid base for carriages, tools and slides . . . how extra-heavy webbing gives the headstock the ruggedness to support powerful gear train members.

Remember, too, that cast iron absorbs vibration. The heavier the better! And Gisholt controls the quality of the finest nickel semi-steel in its own foundry.



The Gisholt 5L Saddle Type Turret Lathe has a net weight of 22,500 lb. without equipment.

What does it mean to you? You can load up your Gisholts with carbides and really turn out the chips! You've got the strength, the rigidity and the freedom from vibration to take all the speed you can get from today's carbides—with the heaviest feeds—and still have the safety margin to take care of tomorrow's tool bit developments.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

STANDARD TOOL
....serving Industry since 1881

● The Standard Tool Man, Serving Industry Since 1881, can show you how to improve finish, increase tool life and cut production costs. He has broad experience on many types of metal cutting. Find out how his tooling knowledge can help cut your costs. The Standard Tool Man is at your service without obligation.

Call him!

Complete line . . . stocked by the Standard Tool Distributor in your area

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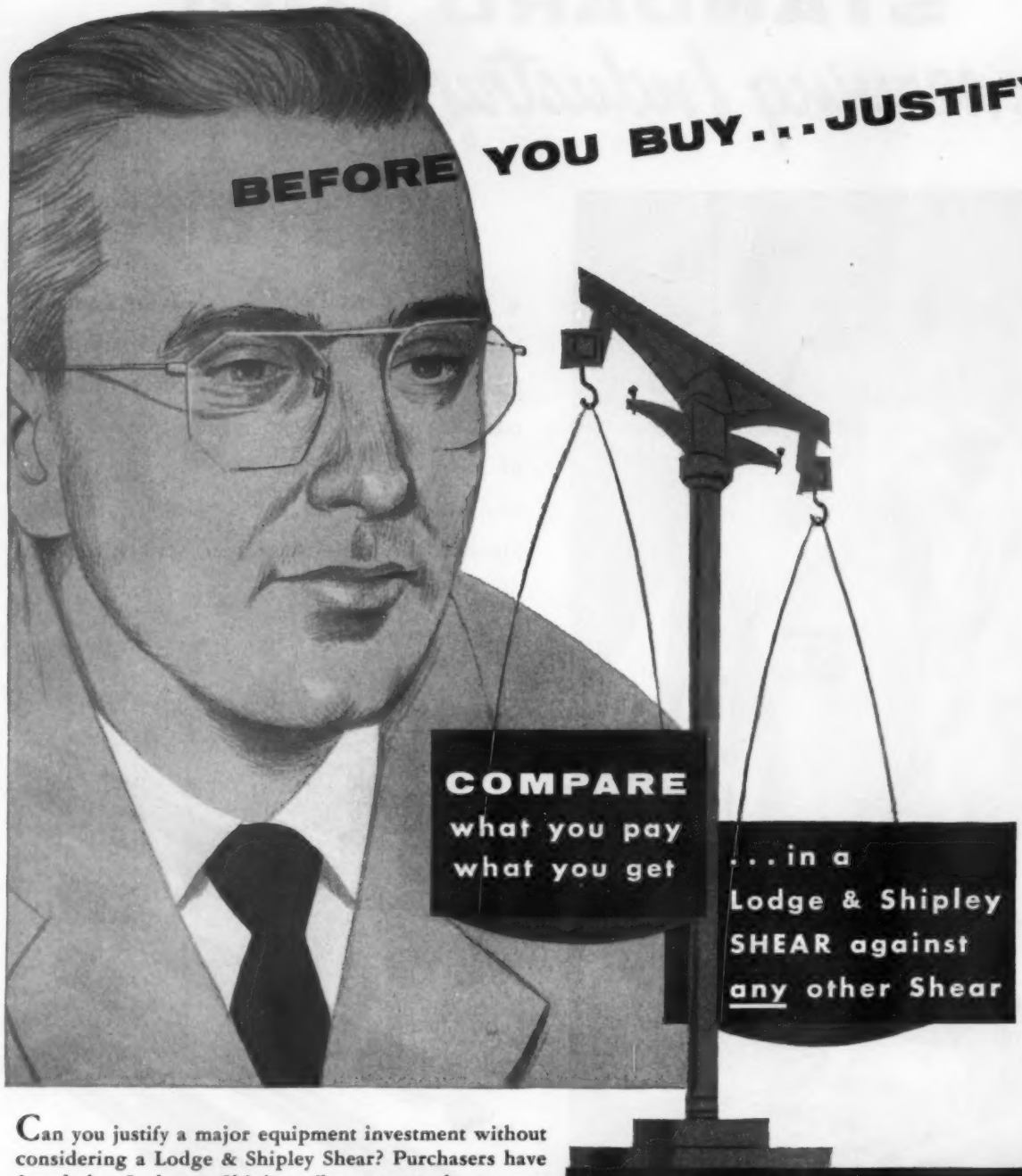
FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special and Carbide-Tipped Tools*



Can you justify a major equipment investment without considering a Lodge & Shipley Shear? Purchasers have found that Lodge & Shipley offers *more* at lower cost than competitive shears.

Determine exactly what you want, what your particular shearing needs require, then check Lodge & Shipley. For accurate, clean cutting . . . smooth, safe operation . . . fast, convenient adjustment and truly low-cost maintenance, Lodge & Shipley Shears are your best investment.

Call the Lodge & Shipley representative. He'll gladly point out special features that can be important to you and arrange a demonstration to your specifications.

Write for FREE Bulletin PS-5 and the name of your nearest distributor.

THE **Lodge & Shipley** COMPANY

HAMILTON DIVISION • HAMILTON 2, OHIO

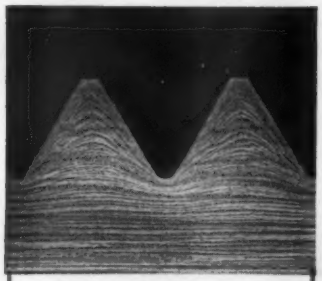
when specifications call for

THREADING from the end

roll threads on your present equipment

with a small investment

investigate National Acme "FETTE" Thread Rolling Heads



PROVIDES STRUCTURAL ADVANTAGES OF COLD-FORMING

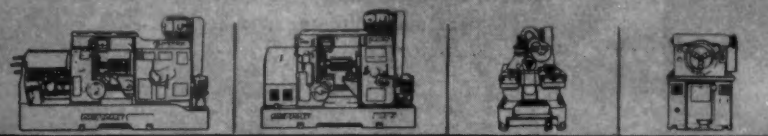
Material rolled flows in an axial direction with slight, radial pressure so that the thread is generated ahead of the rolls. This causes metal to flow to full depth of thread and eliminates broken grain structure and cratering at thread crest. Resulting surface hardening and densifying provides a high grade burnished thread surface remarkably resistant to wear and corrosion.

National Acme "Fette" Thread Rolling Heads and Rolls, *installed on your present turning equipment,* provide a profitable method with which you can do your own thread rolling. They will save you time and give you better control over threading quality and deliveries. Available at only a fraction of the investment you would have in specialized equipment, these self-opening thread-rolling heads can be used right in with your tooling setup on turret lathes or automatics—or to utilize second operation equipment for producing rolled threads.

These heads are available in two types—for revolving or non-revolving spindles. With them, you can roll threads with extreme accuracy and smoothness, at speeds equal to turning speeds of high-speed-steel tools.

For complete details, write today for Bulletin FRH-53B.

You can see National Acme "Fette" Thread Rolling Heads and other threading equipment in action and get all the facts in **Booth Number 324** at the Machine Tool Show. Also, for a demonstration of National Acme's COMPLETE LINE of Multiple and Single Spindle Bar and Chucking Automatics, be sure to visit **Booth Number 705.**



OUR JOB: to provide the *Right Machine* for **YOUR JOB**

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

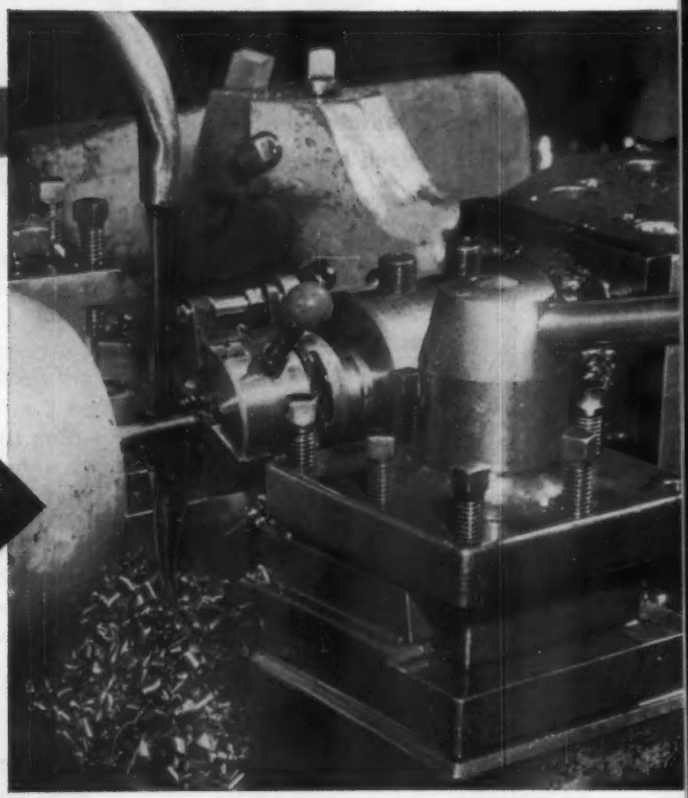
THE NATIONAL ACME COMPANY

171 EAST 131st STREET • CLEVELAND 8, OHIO

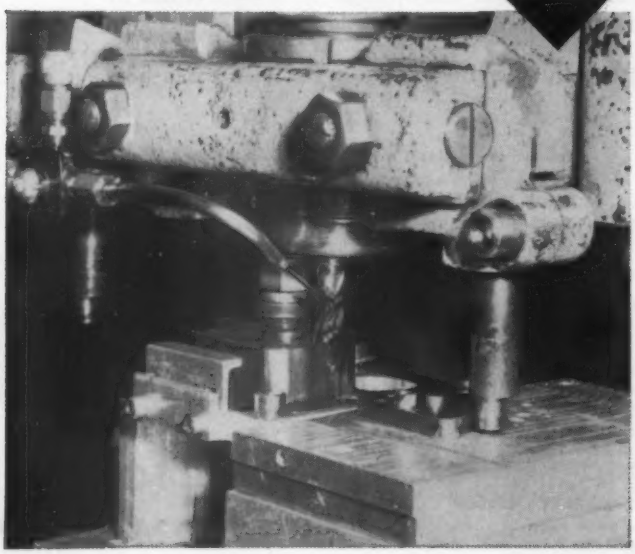
"We found the key to successful machining of ti-stainless--

GULF ELECTRO CUTTING OIL"

says Mr. D. E. Gillmor, Vice President of Gillmors, Inc., Long Island, N.Y.



Improved machining practice on ti-stainless quickly followed a switch to Gulf Electro Cutting Oil in this shop, with results like these: from 20 pieces per tool grind to as many as 45; and finish improved about 43 microns—from 63, the best obtainable with other cutting oils, to as low as 15. For additional information, see page 144 of the September 13, 1954 issue of American Machinist.



Gulf Oil Corporation · Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PA.

Solenoids • Contract Manufacturing.

"We increased our tool life 40% and improved the finish 43 microns"

Mr. D. E. Gillmor, Vice President of Gillmors, Inc., Gulf Assistant District Manager Don Gallaher, and Mr. George Glaeser, General Foreman of Gillmors, examine several of the ti-stainless parts machined with Gulf Electro Cutting Oil.

"WE tried scores of cutting oils over a period of months in an effort to increase tool life and get a better finish in machining type 321 titanium stainless steel. Then a Gulf Sales Engineer recommended Gulf Electro Cutting Oil.

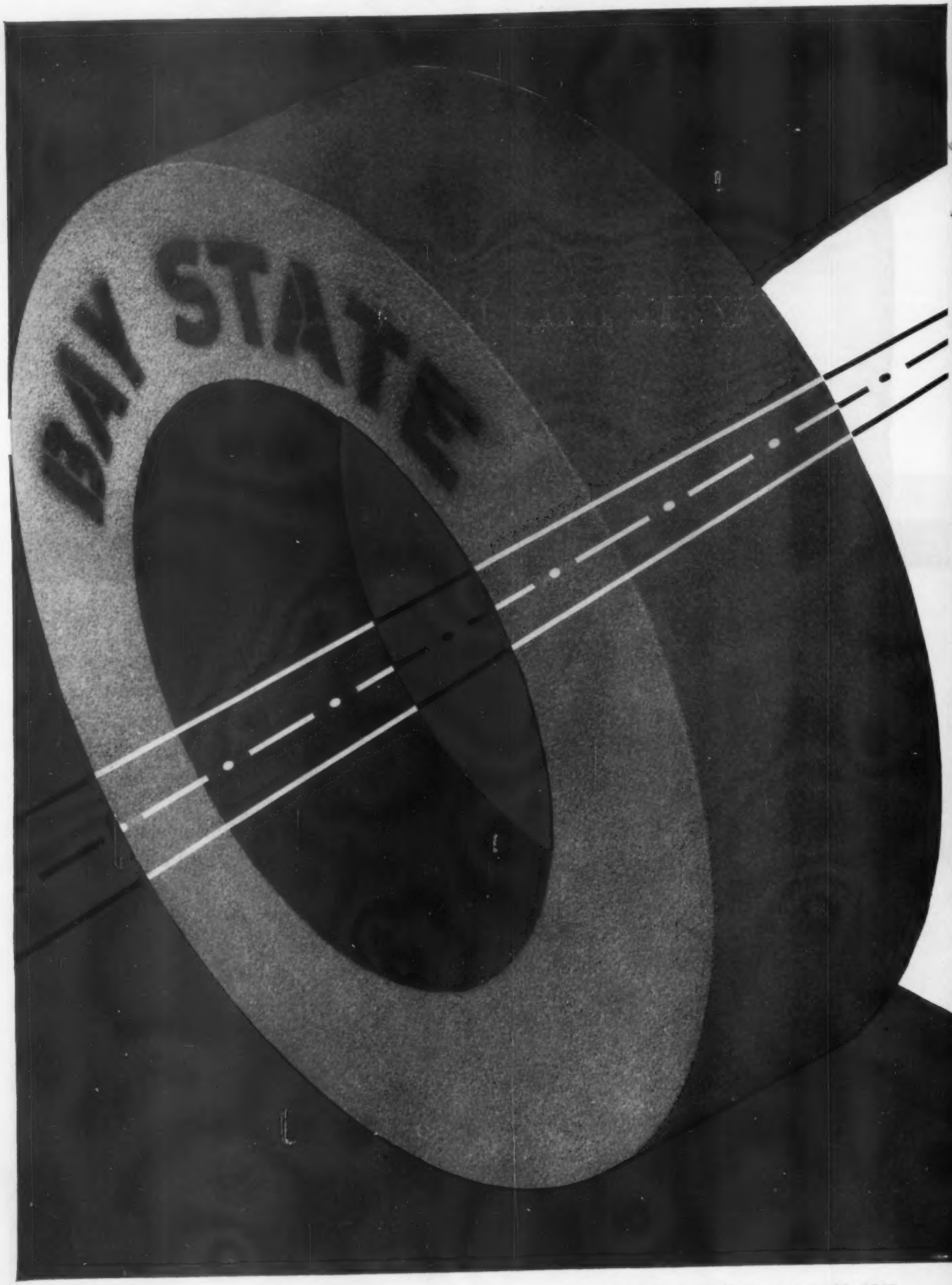
"Right away results were phenomenal. Tool life was increased over 40% and surface finish was improved 43 microns."

Gulf Electro Cutting Oil has proved to be the answer to many tough machining problems like this. It contains both free sulphur—held in stable solution—and sulphurized mineral oil, in which the sulphur is chemically combined by an exclusive Gulf process. This combination provides high sulphur activity over the entire range of a cutting operation—gives the tool maximum protection and helps to reduce built-up edge. It also has excellent anti-weld characteristics and extreme load carrying ability.

And remember that Gulf provides a complete line of quality cutting oils that will help you get improved production and longer tool life in all your machining operations. Write, wire, or phone your nearest Gulf office and have a Gulf Sales Engineer recommend the most suitable type for every job.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS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PROOF that

Bay State Centerless Grinding Wheels

. . . Produce more work with less dressing
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. . . Have greater stamina

Your present centerless grinding wheels may be giving all the production you need. However . . .

In case after case, BAY STATE factory and distributor abrasive specialists are finding ways to improve even such apparently satisfactory conditions, by more accurate wheel selection.

There are good reasons for this. For example, the exclusive Fractional Grades and Controlled Structure give BAY STATE engineers a wider choice from which to select the exact degree of wheel hardness and structure to meet each job's requirements. This wider-range of wheel characteristics becomes increasingly more important as specifications of metals, tolerances, and finishes become more difficult to meet.

We are confident that the combination of these product features and engineering skills applied to your centerless grinding can give top conditions for real production. We invite you to ask us to prove that this is true.

Send for Bulletin 201. Better still ask us, or any BAY STATE DISTRIBUTOR, for free engineering analysis.

BAY STATE ®

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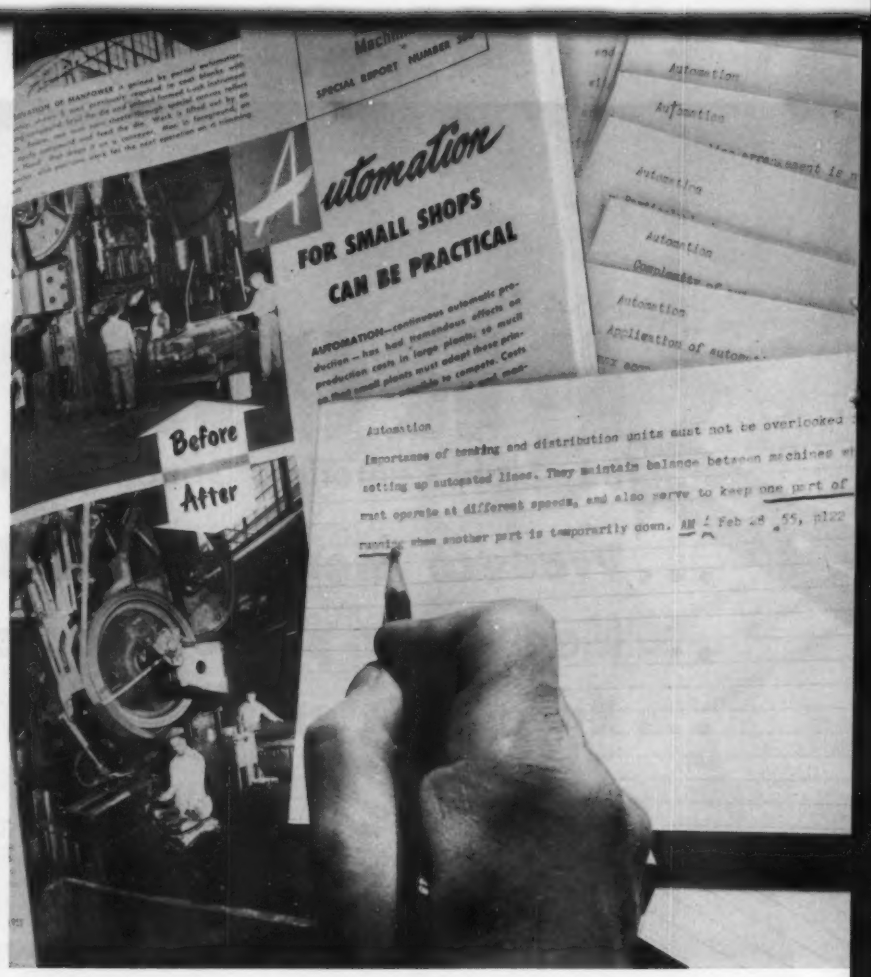
Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario

Manufacturers of all types of Quality Abrasive Products

For the
PRODUCTION
PLANBOOKS
Jim Linsley extracts
the essence of every
American Machinist
article



The result can
guide you to many
production-problem
solutions
for years to come

a new PRODUCTION PLANBOOK is coming in November

. . . it puts another year's *best production ideas* at your fingertips . . . all thumb-indexed, sectionalized, ready to solve every kind of production problem *fast*

Two months before last year's PRODUCTION PLANBOOK was off the presses, *American Machinist's* Associate Editor, Jim Linsley, was busy editing material for *this* year's issue. The result is an unbroken chain of crisp, condensed, continually useful keys to *all* the invaluable production ideas that are fully described in each year's issues of *American Machinist*.

Unless you are a very new reader of *American Machinist*, you know what a goldmine of useful ideas and facts the 1955 PRODUCTION PLANBOOK contains. Last November, it brought Metalworking's production executives a brand-new approach to making their subscriptions to a metalworking magazine pay maximum dividends:

This issue condensed to its essence every new production idea and method the previous twelve months' issues of *American Machinist* had reported upon . . . sectionalized them for quick reference . . . and told in which issue of *American Machinist* full details on each could be found.

Now, in the 1956 PRODUCTION PLANBOOK, this same tremendously useful service will be repeated, with another twelve months' issues of *American Machinist* forming the base for an issue you will find constantly helpful for years to come. And as a brilliant partner to the 1955 PRODUCTION PLANBOOK's 128-page Special Report on "How to Work Steel," the 1956 issue will bring you an equally valuable Special Report on:

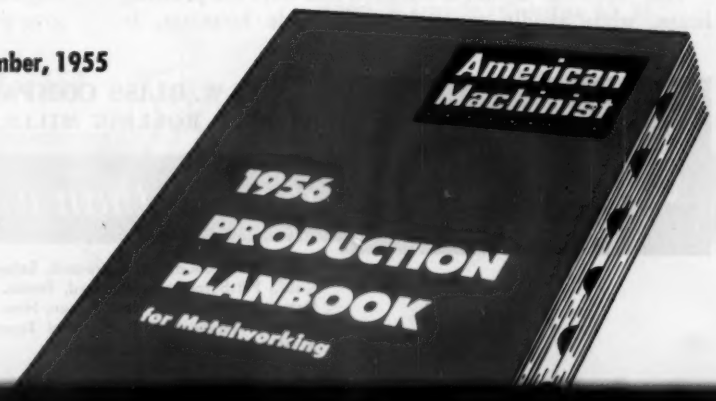
HOW TO WORK NON-FERROUS METALS

Between now and November, Jim Linsley and his staff will be working *every day* to make the 1956 PRODUCTION PLANBOOK tremendously valuable to you. Watch for it. And remember that the 1955 PRODUCTION PLANBOOK is available to you now . . . with its thousands of helpful suggestions on how you can do a better production job. Review your copy again today, or ask your company library for one. Not only will you be very glad you did . . . but it will also serve to remind you of what to expect when the 1956 PRODUCTION PLANBOOK reaches you in November.

To be published by . . . American Machinist . . . in Mid-November, 1955

The McGraw-Hill Magazine of Metalworking Production
McGraw-Hill Building
New York 36, N. Y.

Member of the Audit Bureau of Circulations and the Associated Business Publications
Published every other Monday



NAVAL SHIPYARDS STEP UP PRODUCTION WITH...

BLISS 1000-TON KEEL BENDERS

Rocking action illustrated: slide comes down on work and then rocks back and forth to bend it into desired shape. Key to this smooth rocking action is the fact that weeks were spent in hand-finishing the mirror-like seats at the ends.

At Boston Naval Shipyard, this 1000-ton Bliss keel bender shapes hull, bulkhead and keel plates up to 22 feet long and 10 feet wide—faster, easier and at less cost than previous installations. And here's why...

This press operates like a press brake, but has a unique and different slide (ram) action—it can be moved up or down on an angle and rocked back and forth. With this "skewing" action and properly designed dies, this hydraulic press can form the many different hull and keel plates needed.

The "skewing" action is achieved this way: the pressing beam, while rigidly secured in the slide housings, is flexibly mounted in the crossheads on mirror-like ball seats. This permits the full action desired and gives the press its versatility. The result is a wide choice of pressing combinations and greatly increased production.

In fact, the Navy reports it's "a decided improvement" over older units. Recently, a twin bender was installed at the Charleston (S. C.) Naval Shipyard.

These keel benders, though unique, are actually only recent examples in our history of tackling the difficult in press building. If you are faced with an unusual press engineering problem, why not let a Bliss representative give you the benefit of our collective experience.

E. W. BLISS COMPANY, Canton, Ohio
PRESSES, ROLLING MILLS, SPECIAL MACHINERY

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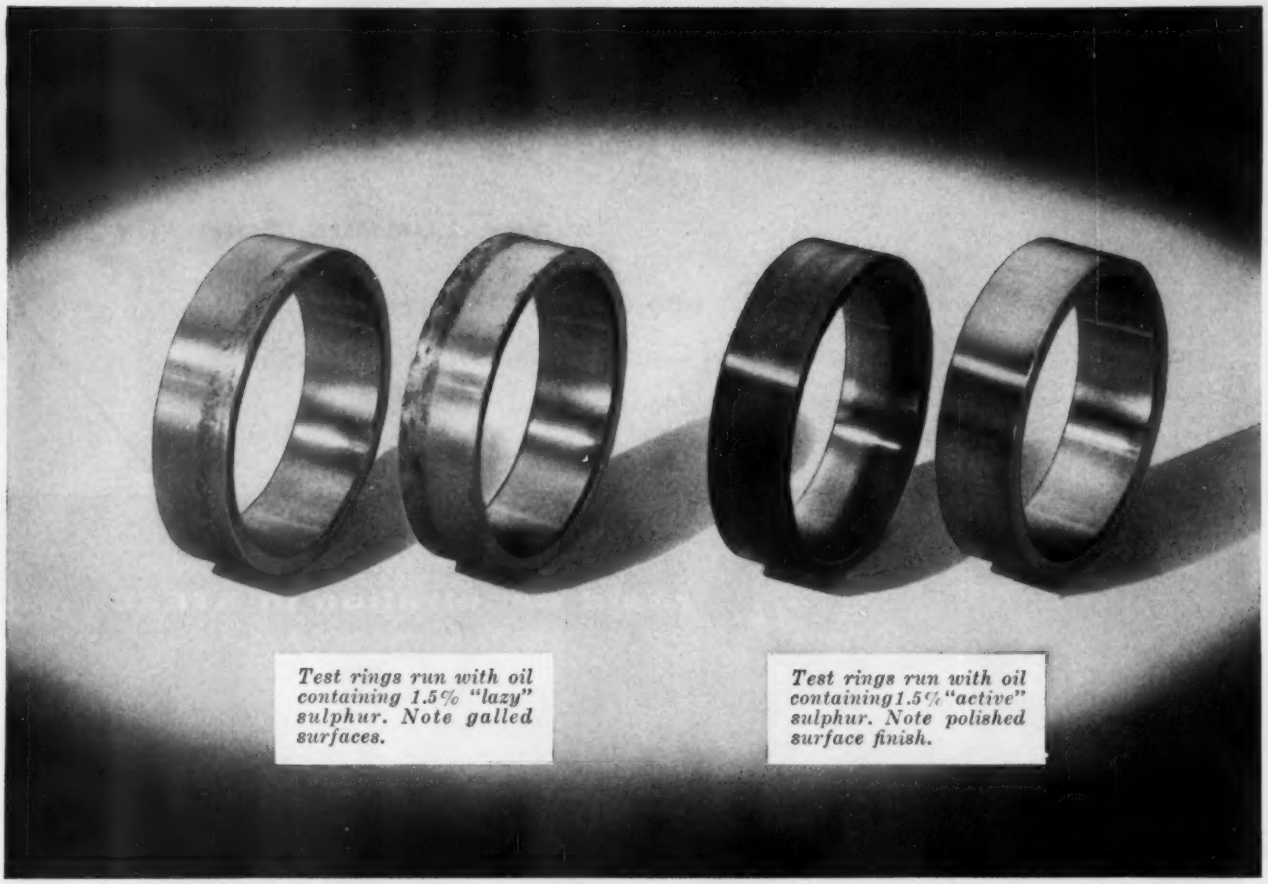
SINCE 1857

is more than a name... it's a guarantee

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Mich.; San Jose, Calif.; Pittsburgh and Midland, Penna. *Branch Offices in* Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Pittsburgh, Rochester, Salem, San Jose, Toledo, Washington, D. C.; and Toronto, Canada. *Other representatives throughout the world.*
E. W. Bliss (England) Ltd., Derby — E. W. Bliss Co. (Paris), France



Test rings run with oil containing 1.5% "lazy" sulphur. Note galled surfaces.

Test rings run with oil containing 1.5% "active" sulphur. Note polished surface finish.

Only ACTIVE Sulphur Provides Fluid Lubrication Under Extreme Pressures

This comparative test proves it! Both tests were run on an SAE Lubricant Tester using two oils with the same percentage of sulphur. The specifications were similar—but look at the results!

The set of rings on the left were run with an oil containing "lazy" sulphur that did not provide the necessary anti-weld qualities. Under the heavy loads present in the test, the rings quickly galled and seized. The pair on the right were run with an oil containing "active" sulphur, the *only* type of sulphur that will prevent galling or seizure. It is performance that counts, not specifications.

"Active" sulphur in a cutting oil, readily reacts with the metal surfaces of the tool, chip and workpiece to produce metallic sulphide films that become fluid lubricants when sufficient heat is generated, and provide lubrication under the high temperatures that exist in the cutting orbit.

Stuart Oil Company's Shop Note Book, Bulletin S-2, contains further information on how to select a sulphurized cutting oil. Write for your copy today, and ask to have "the Man in the Barrel", your Stuart Representative, call too. He will help you select the cutting fluid that will provide the very best results under the conditions you will subject it to.

D.A. STUART OIL COMPANY, LTD.
2729 S. Troy St., Chicago 23, Ill.

More than a "Coolant" is Needed

Stuart Oils

Time Tested Cutting Fluids and Lubricants

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

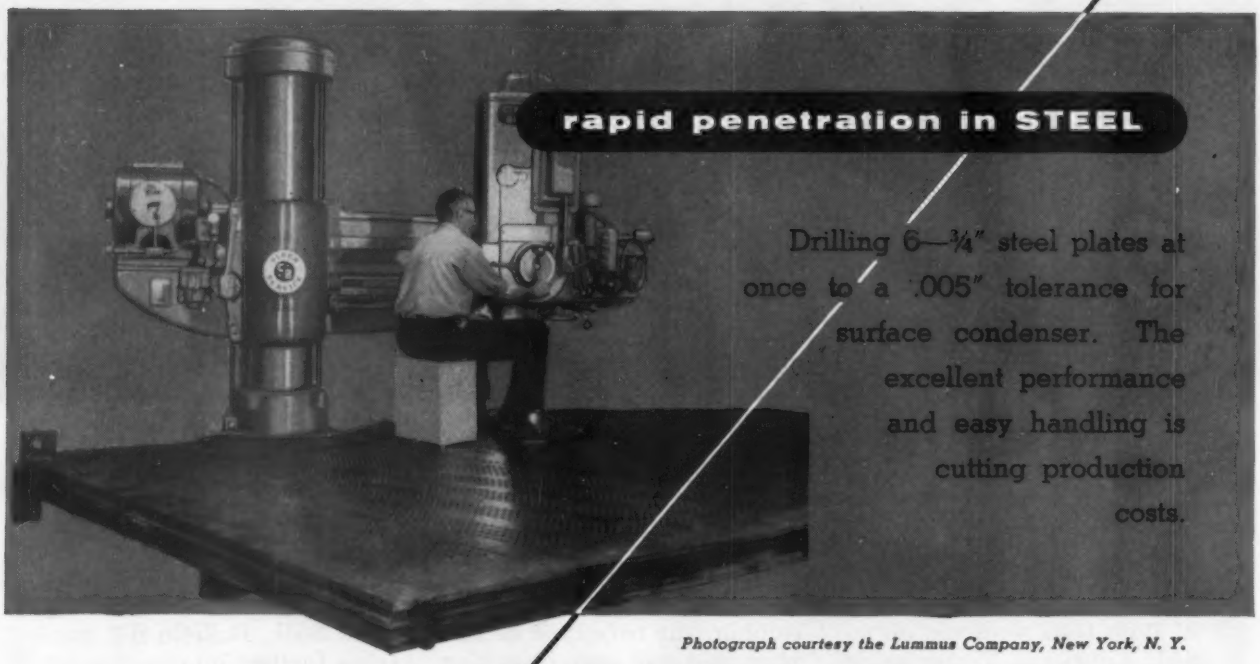
E. W. Bliss (England) Ltd., Derby

E. W. Bliss Co. (Paris), France

rapid drilling with ACCURACY saves money

at THE LUMMUS COMPANY

On jobs like these the ease of control, the accuracy and the outstanding speed of penetration of Cincinnati Bickford Radial Drills pay big dividends.



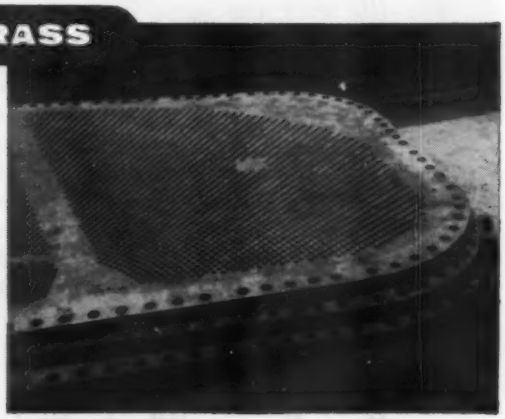
rapid penetration in STEEL

Drilling 6—¾" steel plates at once to a .005" tolerance for surface condenser. The excellent performance and easy handling is cutting production costs.

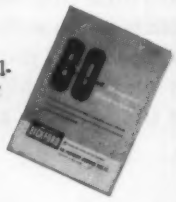
Photograph courtesy the Lummus Company, New York, N. Y.

rapid penetration in BRASS

Drilling 4 brass tube sheets, 1½" thick, simultaneously to a .002" tolerance, a special spiral brass drill penetrates at the rate of 10" per minute.



Of interest to every user of Drilling Machines—Write for your copy of 80-year Anniversary Booklet.



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RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

"SAND SCREEN's" unique open-mesh construction lets removed material flow *right through*...instead of loading or glazing, like conventional paper and cloth. What's more, *both* sides are usable—give you 7 to 15 times longer life. Use "SAND SCREEN" wet or dry, by hand or machine. It tears and folds easily to any desired size. Cut sheets fit oscillating or vibrating machines. "SAND SCREEN" Discs give best results when used wet with CARBORUNDUM's FASTCUT® Pad 85 Assembly. Try it—see how it slashes polishing and finishing costs in your shop. For a free sample, call your CARBORUNDUM Distributor or salesman, or write The Carborundum Company, Niagara Falls, N. Y. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

Through product quality and application "know-how"

CARBORUNDUM

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continually puts more sense in your abrasive dollar

Nary a slip 'twixt the job and the disc

PHOTOGRAPHED AT MORRISON STEEL PRODUCTS, INC.

One look at this new Resin Sander Disc by CARBORUNDUM tells you it's no sissy. One trial in your shop *proves* how tough it is. It bites into metal fast...cuts free and cool...stays sharp from start to finish. The rugged all-fibre backing, plus a resin bond with greater holding power, means far more work per disc. The edge holds shape longer, even on your most severe grinding jobs. Resin Sander Discs are designed for both snagging and surfacing operations, come in types and sizes to fit all Disc Sanders.

For a free demonstration of this new cost-cutter, call your CARBORUNDUM Distributor or salesman today. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

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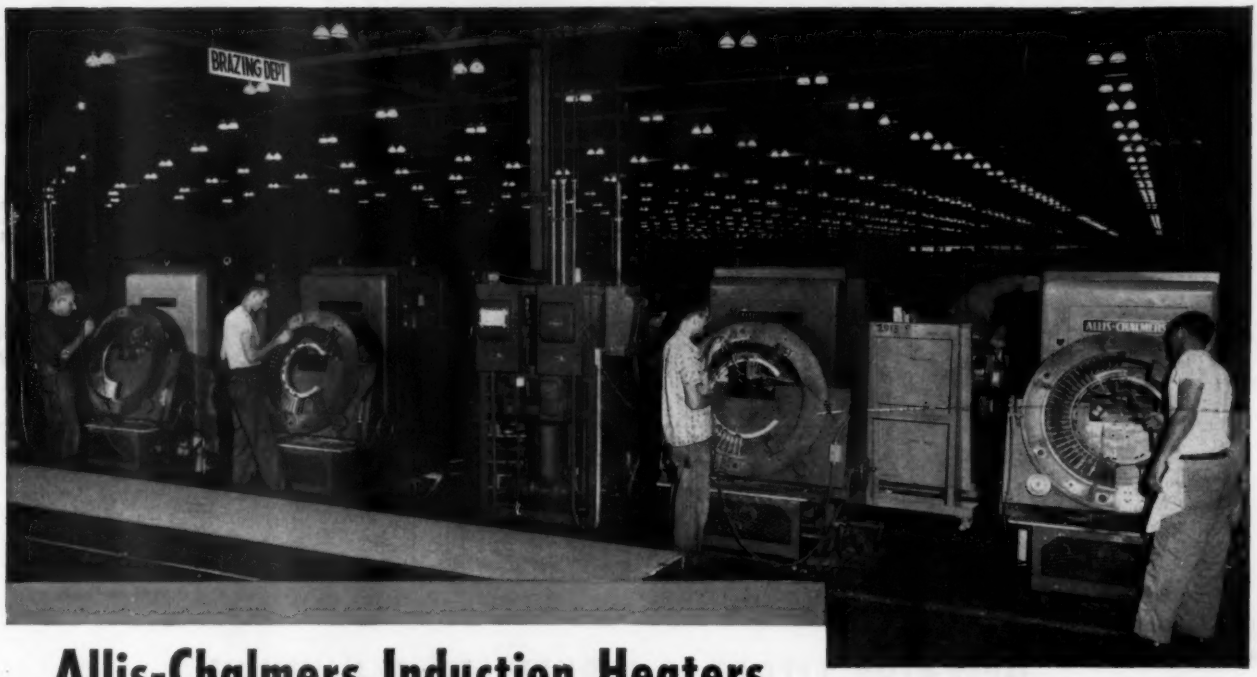
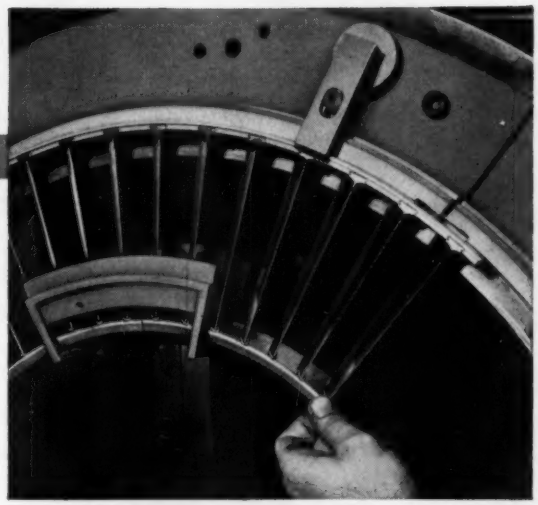
continually puts more sense in your abrasive dollar



Allis-Chalmers Induction Heaters

Cut Brazing Time 50%

and Increase Uniformity



The brazing alloy, in wire form, is clip shaped. Photo shows how clip is slipped over one edge of the blade. As alloy heats, at temperatures from 1350 to 1400 F, it flows around the entire base of the blade.

Here's what happened when a turbojet engine manufacturer replaced hand brazing methods with eight Allis-Chalmers Electronic Induction Heaters.

The work involved brazing shrouds to the tips of compressor blades.

Today, using the Induction Heaters and special fixtures, the job is performed in a continuous operation without pulsation or reheating of components. It takes only half the time formerly required. Brazes are more uniform and the average pull test loading is 33% above minimum of 2800 pounds.

Here's what Induction Heating can do for you...

If your work involves brazing, soldering, annealing, heating or hardening — it will pay you to know about Allis-Chalmers Induction Heaters. In practically every installation they have resulted in substantial increases in production or product preference, and healthy cuts in material costs and rejects. See your nearby district office or write for details. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4578

ALLIS-CHALMERS

Hendey NO. 2E LATHE WITH ELECTRONIC

simplifies lathe operation . .

OPERATOR EFFORT IS REDUCED TO A MINIMUM
MACHINING EFFICIENCY IS INCREASED
16-7/16" SWING OVER WAYS
COSTS ARE CUT AT EVERY TURN

Hendey electronic control of spindle speeds on No. 2E Precision Lathes is effortless with this convenient fingertip selector. It affords a quieter, more efficient drive, with closer control over speeds than is possible with other types, especially at the slower rates. Speeds are adjusted smoothly, either pre-set or while cutting, through the full range up to 1500 r.p.m. to give the most efficient cutting rate for the particular type of cut. Operating efficiency is further stepped-up by single-lever control of start, stop and reverse. Dynamic braking allows smooth and rapid changing from forward to reverse rotation of the spindle.

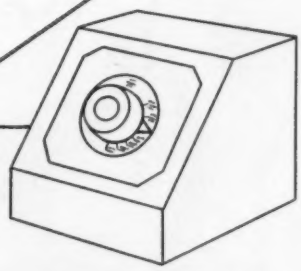
Additional Hendey quality features make this general purpose lathe a machine you should see before you buy any lathe . . . especially if you want maximum operating efficiency, work accuracy and reduced cost on turning operations.

See It In Action! Booth No. 221

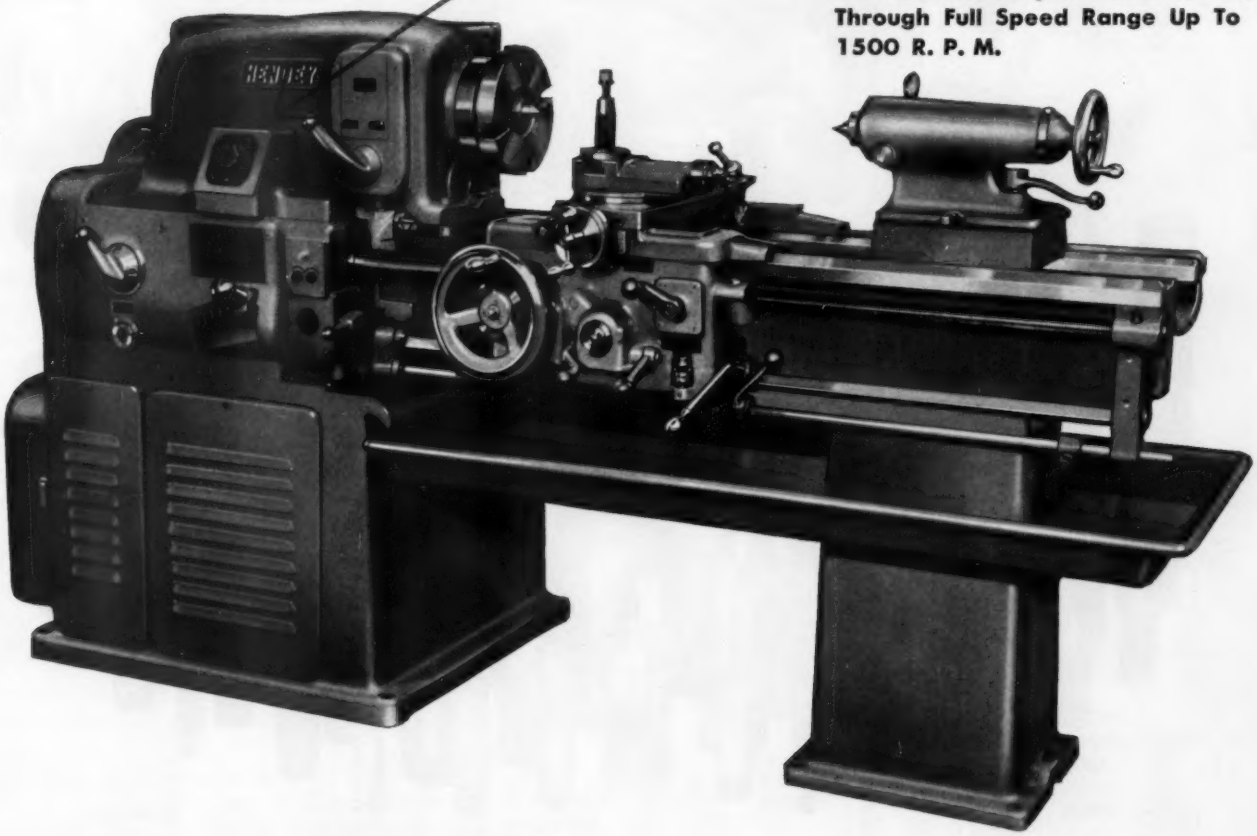
TOPS IN ACCURACY . . . HENDEY PRECISION-BUILT

SPEED SELECTOR

cuts production time



Instantaneous Speed Selection . . .
. . . Pre-Set or While Cutting . . .
Provides Infinitely Variable Control Through Full Speed Range Up To 1500 R. P. M.



MACHINE TOOLS *Hendey* machine division
BARBER-COLMAN COMPANY
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Automatic Screw Machines — Turret Lathes —
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***EXPORT OFFICE:* 269 LAFAYETTE ST., NEW YORK 12, N. Y.**

At your fingertips

and at real savings - small drawn parts by

Hydroforming

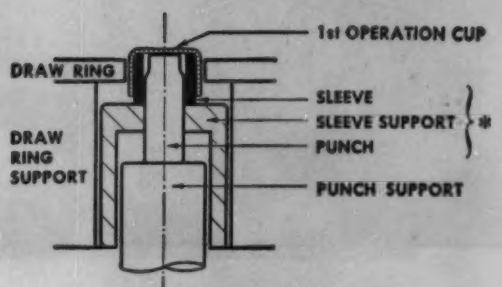
Cincinnati 8" Hydroform

THE NEW CINCINNATI 8" HYDROFORM brings decided time and cost savings to manufacturers required to produce small, deep drawn and formed parts. Illustrated above is a typical example.

The photo shows, in sequence, the three Hydroforming operations to produce an electron tube component. Material is 0.020" O. F. H. C. copper. This part would have required five or six operations by conventional methods.

To illustrate the simplicity of Hydroform tooling, the diagram below, right, shows the redraw tools used in the second operation. The sleeve, sleeve support and punch were made of ordinary steel, turned on a lathe. The 1¼" dia. x 1¼" deep 1st operation cup was simply placed on the sleeve and redrawn. Redraw tools for the final operation were similar and equally inexpensive.

Parts from sheet materials up to ¼" steel, from blanks up to 8" in diameter, can be drawn on the 8" Hydroform. Maximum draw depth is 5". For larger work, Hydroform machines of 12", 19", 23", 26" and 32" capacities are available. Let a Cincinnati Milling field engineer give you detailed information on how you can profitably apply Hydroforming to your work. For a description of the process and specifications of the six machine sizes, write for Bulletin M-1759-3.



**2nd Operation Redraw Tools*

CINCINNATI **Hydroform**

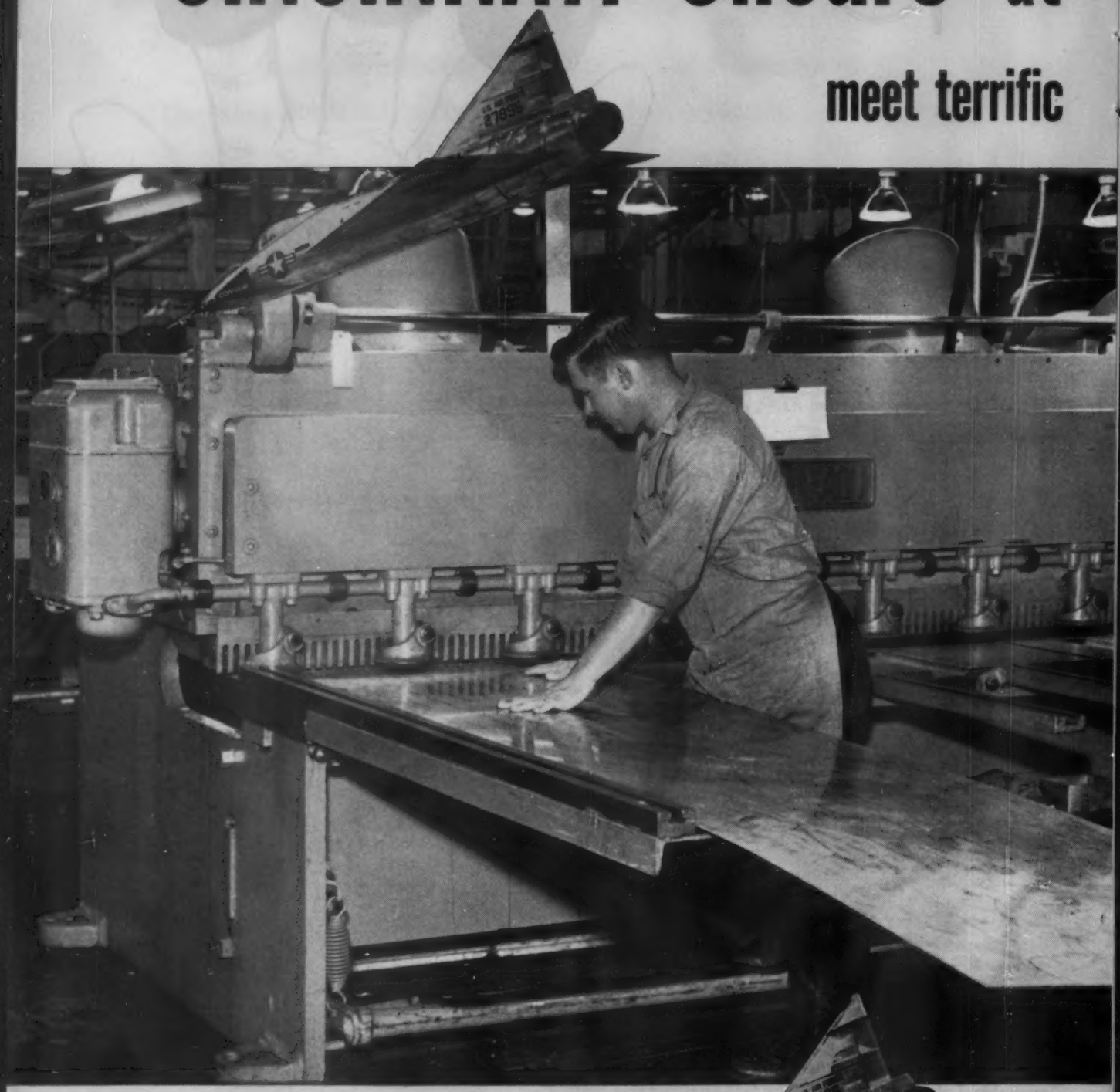
PROCESS MACHINERY DIVISION

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI Shears at

meet terrific



Materials being sheared in these illustrations are .093 Nimonic and .050" 5510 stainless steel.

Photos courtesy Pratt & Whitney Aircraft, East Hartford, Connecticut and Convair, San Diego, California.

CINCINNATI 9, OHIO, U. S. A.

PRATT & WHITNEY AIRCRAFT

demand for jet aircraft engines . . .

The right tools for the job were needed at Pratt & Whitney Aircraft, in their tremendous expansion, in the production of the highest power turbojets.

Cincinnati Shears are used in this program. Their accurate performance and ability to shear a wide variety of materials decided their selection.

Investigate:

- Cincinnati "Single Clearance" shearing
- Cincinnati Hydraulic Holddowns
- Cincinnati All-Steel Interlocked Construction

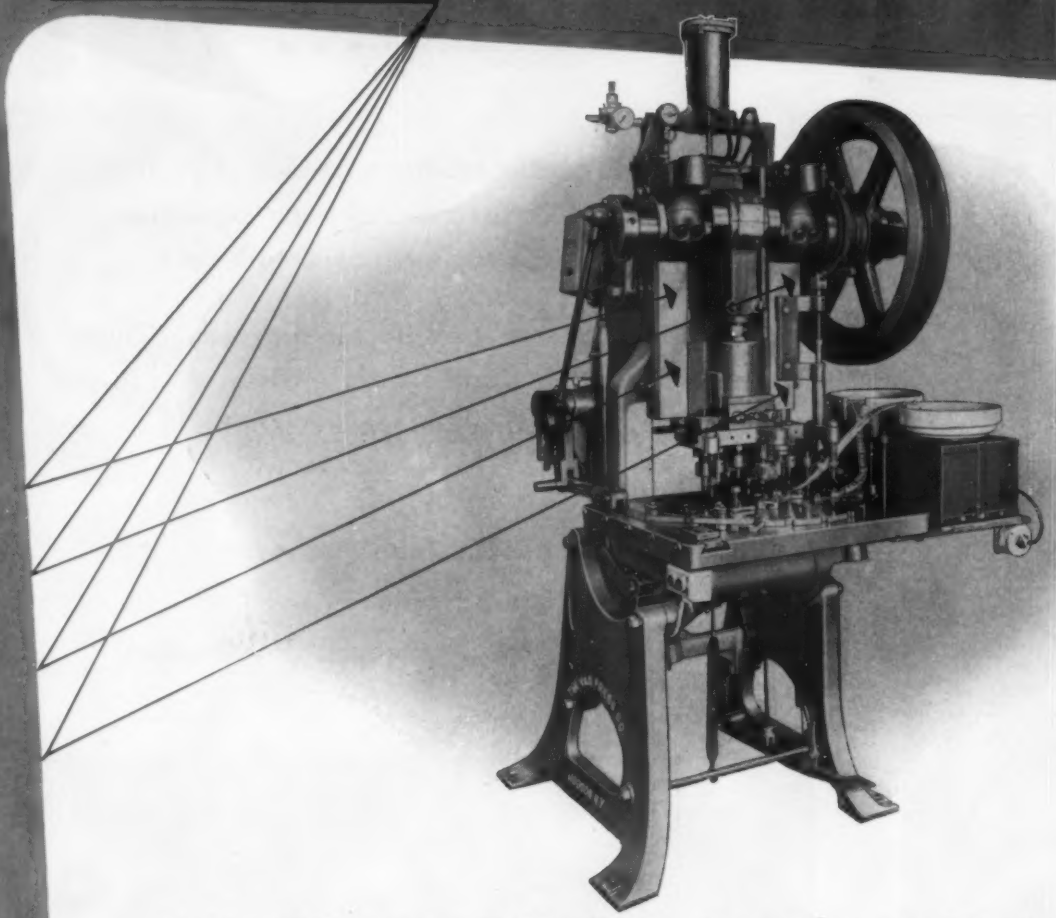
Write for complete Shear Catalogue S-6.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

Precision presswork (AND COST REDUCTION) starts here where V & O leads



And has led for more than 65 years. Slide lengths in V & O's are two to three times longer than usual in O.B.I. presses. But that's only part of the story. To assure the full benefits of long slide precision, V & O builds the rest of the press to the highest machine tool standards. Slides and bearings are hand-scraped. The pneumatic clutch is the most advanced available. Rugged construction assures the extra-rigidity so essential to precision presswork.

For presses equipped and automated to perform specific jobs, consult V & O. For presses that are easiest for your own toolmakers to automate or equip, make sure they're V & O's.

Only the best is good enough

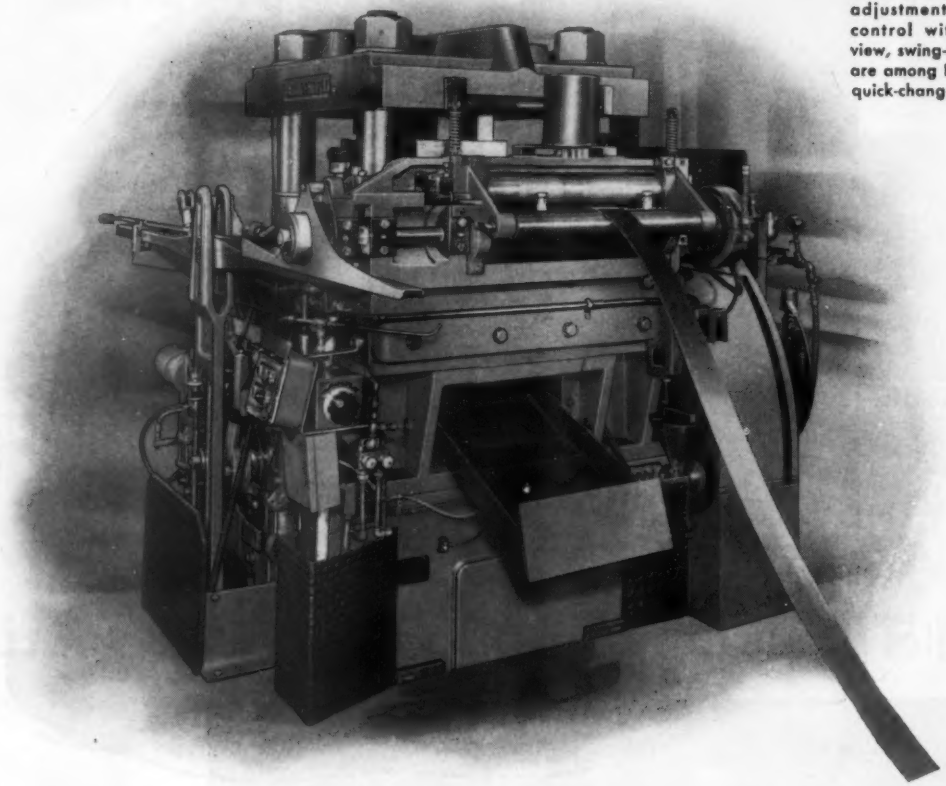
THE V&O PRESS COMPANY DIVISION
301 UNION TURNPIKE, HUDSON, NEW YORK

Our representative will be glad to give you the complete story about V & O presses and engineering services. For more information please write for our catalog.

EMHART

Two to three die changes a day

HENRY & WRIGHTS COMBINE HIGH SPEED OPERATION WITH HIGH SPEED JOB CHANGE



Open construction, easy-to-make shut height and feed adjustments plus inching control with die in full view, swing-away roll feeds are among Henry & Wright quick-change features.

As many as two to three job changes in a day are being made by companies taking advantage of the quick-change features of Henry & Wrights. These companies report sharply reduced costs on short runs. A contract plant said it had greatly improved its competitive cost situation and was re-bidding on jobs previously lost.

Their unique quick-change features are just some of the reasons why Henry & Wrights rate preference in modernization programs. Other advantages are high speed with minimum vibration, precise alignment of punch and die, quick-stop pneumatic clutch, overall rigidity—and the assurance of longer die life.

Only the best is good enough

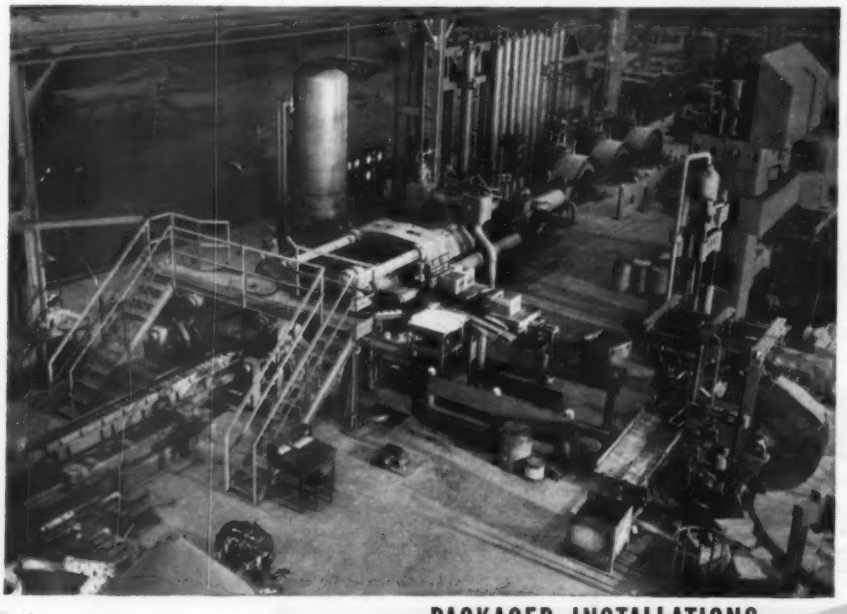
You owe it to yourself to get the complete story about Henry & Wrights and how they can improve your stamping methods. Our representative will be glad to give you the details.

HENRY & WRIGHT DIVISION
481 WINDSOR STREET, HARTFORD, CONNECTICUT

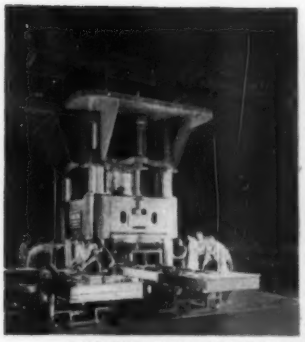
MFG. CO.

DRAWING

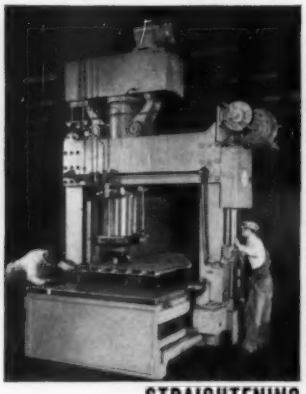
From a single press to a packaged installation . . .



PACKAGED INSTALLATIONS



RUBBER PAD FORMING



STRAIGHTENING

FORMING

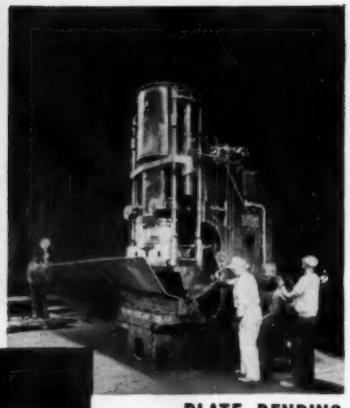


PLATE BENDING

BULLDOZING

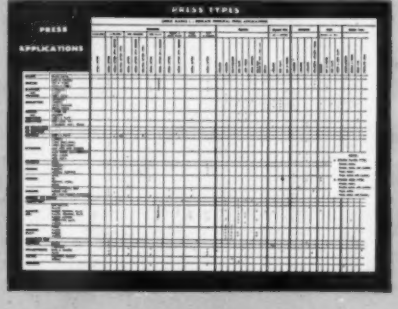
EXTRUDING

LAKE ERIE MAKES THEM ALL

More than 3,500 developed designs of hydraulic presses to meet every pressing requirement are immediately available to you at Lake Erie. Make it a practice to consult Lake Erie about your hydraulic press needs.

(Leasing and deferred payment plans tailored to your exact needs.)

SEND FOR HANDY BUYER'S GUIDE ➧



LAKE ERIE HYDRAULIC PRESSES

EXTRUSION PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

LAKE ERIE ENGINEERING CORP. *General Offices and Plant: 507 Woodward Ave., Buffalo 17, N. Y.*
District Offices in New York, Chicago, Detroit, Pittsburgh
Representatives in Other U. S. Cities and Foreign Countries

LAKE ERIE®

you can drive to the poorhouse

This is not intended as a joke: the machine tool that was ▸ *paid for* long since may today produce an annual loss equal to its cost of replacement. We know, because Avey equipment has helped many companies to stop losing money on antiques, and make money so fast that the investment was paid for in a year or year and a half. Why?

Because Avey production drilling machines are essentially simple, compact, straightforward in design, built in standard units that fit together to fit your job, and function with standard work-holding fixtures. When a production run is finished, the units are often rearranged for another job, at a fraction of the cost of the original setup, and the owner gets an even bigger bonus of earnings.

Are you really convinced that your drilling operations are now running at top efficiency? Send us your part prints and if we can't be convinced, too, *you stand to gain.* ◂

This Avey machine mills 88 slots in a stainless steel jet engine part—a slot every 40 seconds. Vertically mounted automatic cam feed unit produces desired cycle time. Cutter head can't operate unless automatic indexing table is in correct position. Our advanced Electrodex table makes it easy to change fixture and part quickly with only slight change in indexing mechanism.

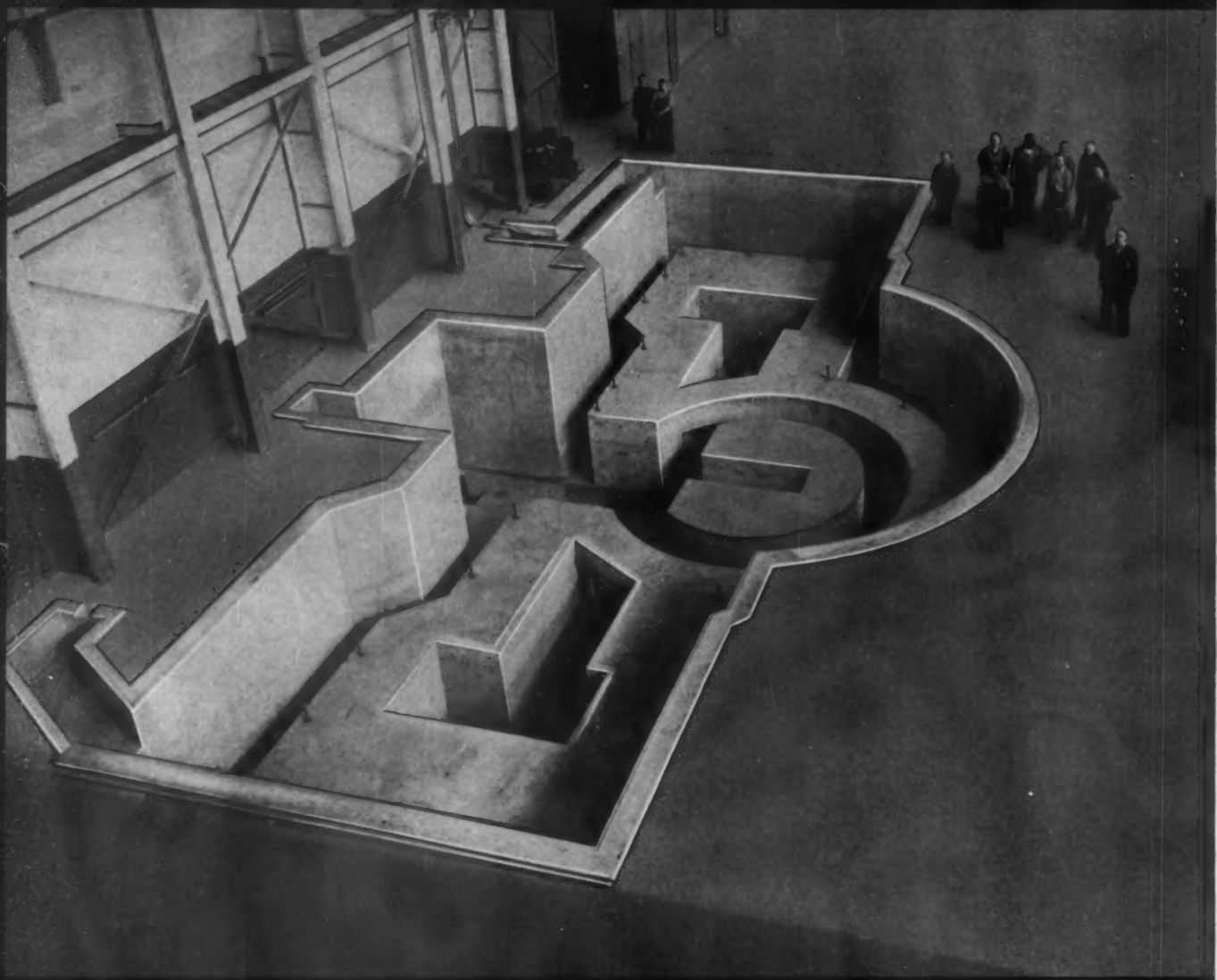
THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

... in a car that's paid for

Avey

drilling, tapping, production machines

Now You Can



Foundation for the Betts 42 foot Vertical Boring and Turning

CONSOLIDATED MACHINE TOOL

A DIVISION OF FARREL-

Build Them BIGGER!

Mill

The size of the equipment in your own shop need no longer limit the size of the products you build.

Consolidated is completing a two million dollar shop expansion program that will make some of the world's largest machine tools available to you for your own big work.

This program includes a Betts 42-foot Vertical Boring and Turning Mill, a Betts 96-inch Lathe with 50 feet between centers, a Sellers 10-inch Floor Type Horizontal Boring and Milling Machine with 12 feet of head travel on the column and 25 feet of column travel on the runway. The two new cranes in this big shop have a combined lifting capacity of 150 tons.

This equipment with Consolidated's other big tools and skilled workmen are available to you. You can now build your own products larger and we will help you do it.

COMPANY, ROCHESTER 10, N. Y.

BIRMINGHAM CO., INC.

F/B

SPARK TEST

Shows how a Taft-Peirce No. 1 Surface Grinder Repeats to .00005"

Here is a surface grinder so accurate that few people would believe it until this simple demonstration was devised.

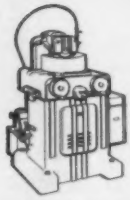
Take a side wheel grinding setup. Grind to a zero reading on the cross feed dial. Move the work away one or two thousandths with the cross feed vernier, then back to its original position. NOTE: There's no grinding spark. Now, feed in ½ of a tenth with the vernier and SEE THE GRINDING SPARK.

To our knowledge there's never been a standard grinder built before that even comes close to the accuracy of a T-P No. 1 Surface Grinder. An experienced operator frequently can grind to less than .00005" . . . with surfaces so smooth, in many cases, they seal without lapping.

Table, saddle, and column travel on anti-friction bearings retained in vees of hardened and ground alloy steel. Tilting wheelhead simplifies setups. Vernier fine-feed attachments, graduated in .0001" increments spaced ½" apart, are available for either the horizontal or vertical feed.

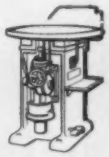
Compact, yet heavier than other machines, the No. 1 Surface Grinder maintains its accuracy over many years of rugged service. For more information, write for bulletin.

See it in action at the Show Booth 811


Rotary Surface Grinders

Precision Surface Grinders

Lapping Machines


Back Spot Facing Machines

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY • WOONSOCKET, RHODE ISLAND

It MUST have been good!

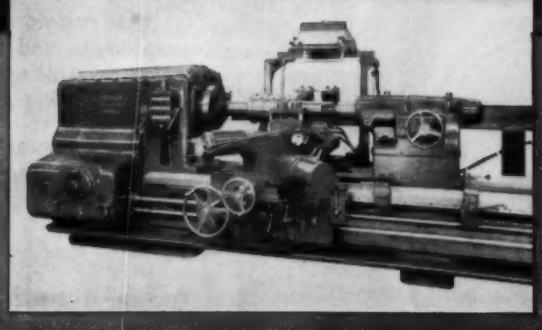
There are times when expressions speak louder than words.

Here's a group of distinguished steel mill roll executives watching a demonstration on a 26" Capacity "AMERICAN" Hydraulic Roll Lathe—judge for yourself whether or not they are satisfied with what they saw.

These machines are performing "miracles" in savings in many of the best known roll shops in the country. They have introduced a brand new machining technique that has revolutionized the art of roll turning. They reproduce work shapes from a template faithfully and accurately not only on steel mill roll bodies and necks, but on such work as spindles, motor shafts, valve stems, step shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

Evidence from hundreds of installations proves beyond a shadow of a doubt their leadership as top-flight cost reducers. Was there ever a time when cost reduction was more urgently needed?

If it's proof you want just drop us a line—no obligation.



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Q. Why does Blanchard grind its own machine parts on a Blanchard?

A. It's the only way we know to get highest quality at lowest cost!

Shown here are 117 different parts of a #18 Blanchard Grinder. 239 surfaces on these 117 parts were ground on a Blanchard, for the simple reason that *there isn't any better way.*

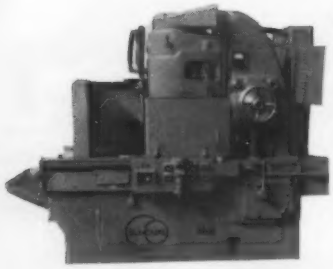
Everyone who uses Blanchard Grinders knows that Blanchard elements are machined with extreme accuracy . . . that they *have to be!*

Furthermore, Blanchard users everywhere would undoubtedly agree fully with these two actual statements recently made by customers:

"There is no greater machine tool money value than a Blanchard. It is the best buy we ever made".

"Until our Blanchard went to work, I never realized I could actually save so much, as compared to previous methods of machining flat surfaces".

If you do not own a Blanchard, we invite you to select some of your own components, and let us give you estimates to compare with your present quality control tolerances and machining costs. Chances are you'll find it will pay you to ***"PUT IT ON THE BLANCHARD".***



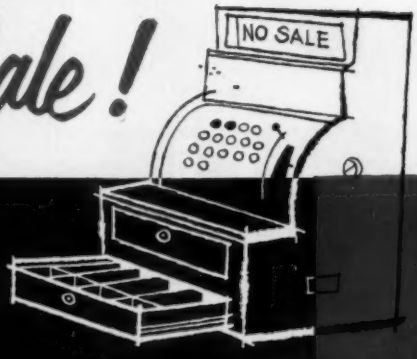
P. S. You guarantee yourself full benefit from your Blanchard Grinders when you use the correct Blanchard abrasive wheels!

Send for free copies of "Work Done on the Blanchard", (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

THIS MONA-MATIC *Cost us a Sale!*

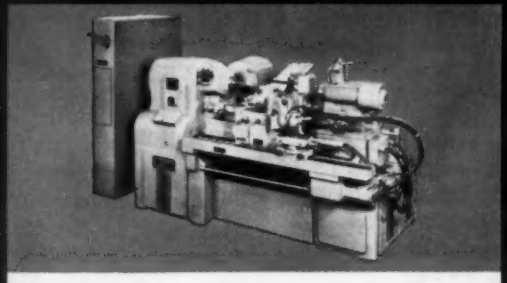


That's a reason *you* should buy one?

You bet—and here's why! Sterling Electric Motors of Los Angeles intended to buy *2* of our Mona-Matics to replace *3* multiple-tool lathes. But they found out they didn't need the second one. Mona-Matic #1—alone, says E. K. Johnston, Sterling Factory Manager, machines shafts 82% faster, and has replaced the *three* production lathes previously used. Example: 2 min., 7 sec. on job pictured—completely turn, including thread relief, necks, radius and chamfers.

Remember, this is on small lot production—as Sterling Electric Motors, with many different shaft designs, has the problem of production quantities. Speaks well for simplified Mona-Matic setups, doesn't it? And as for tool cost—they have eliminated all radius, necking and chamfer tools.

Why not profit by Sterling's experience? You, too, will find that Monarch turning methods bring rewarding results . . . ***The Monarch Machine Tool Co., Sidney, Ohio***

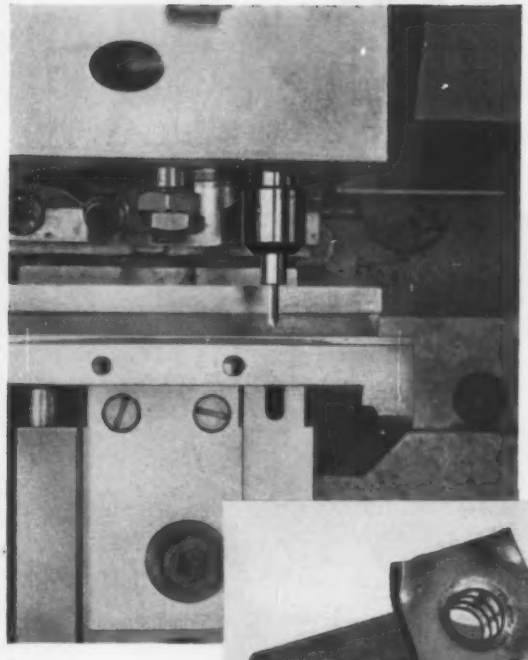


THE FAMOUS MONARCH MONA-MATIC with Air-Gage Tracer. Use of single tracer-controlled running tool speeds production, slashes tool costs, tool change time and setup time, subsequent grinding. Greatly increases accuracy, too.

Monarch

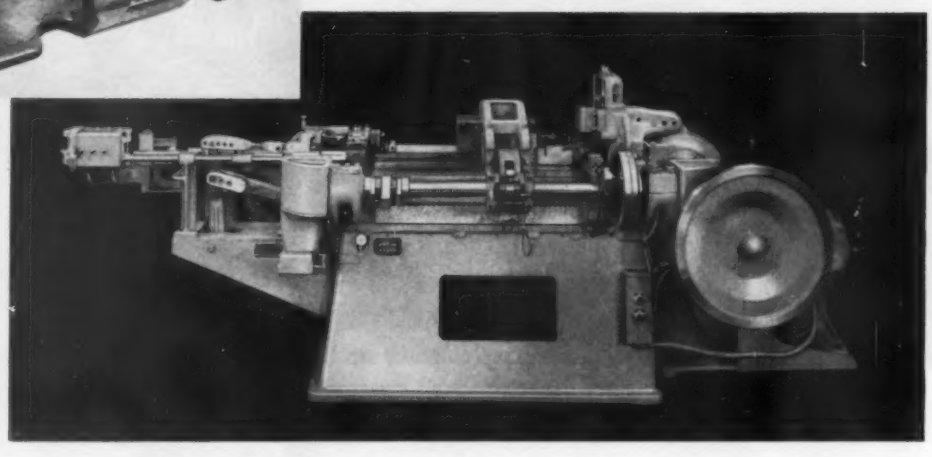
TURNING MACHINES

FOR A GOOD TURN FASTER—TURN TO MONARCH



Now! **In addition to trimming, piercing, swaging, embossing, blanking and forming . . . .**

TAPPING on the U. S. MULTI-SLIDE®



Top: Close-up top view looking down into tapping position on the U. S. Multi-Slide.

Above: Allen-Bradley Coil Terminal produced complete on No. 33 U. S. Multi-Slide, including tapping a 6-32 hole. Shown about three times actual size.

Right: Standard No. 33 U. S. Multi-Slide Machine which is used (with the addition of a tapping head) for the production of the part shown above.

See this equipment in operation at BOOTH 215, MACHINE TOOL SHOW, International Amphitheatre, Chicago, Ill., September 6-17, 1955.

The Allen-Bradley Company of Milwaukee, Wisconsin, manufacturers of quality motor controls, will install in their plant a No. 33 U. S. Multi-Slide Machine equipped with a tapping head to produce the Coil Terminal shown above *complete including the tapping of a 6-32 hole.* The incorporation of tapping in the U. S. Multi-Slide eliminates the need for a secondary operation on this part.

The U. S. Multi-Slide is designed and built for the automatic production of stampings, and any or all of the following operations may be incorporated to produce complete parts at each stroke of the machine: trimming, piercing, swaging, embossing, blanking and forming. Now the possibility of including a tapping operation further increases the versatility of the Multi-Slide, and offers to the user increased potential for cost reduction by eliminating secondary operations and handlings.

Bulletin No. 15-A contains complete specifications. Write for a copy.

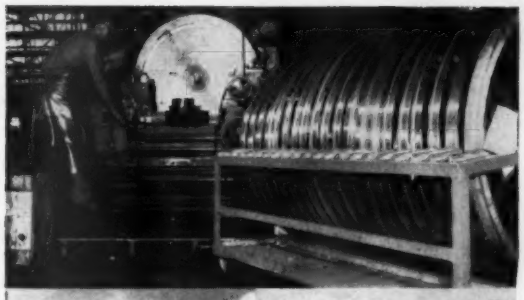
U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

Lodge & Shipley T LATHE helps keep 'em flying LONGER



40″ diameter aluminum alloy rings are machined to exacting limits on the Lodge & Shipley T Lathe.

Boeing KC-97 Stratotanker wing tanks keep the plane in the air longer. T Lathe-machined rings keep the tanks gas-tight.

SEE IT NOW! and SEE IT AT THE MACHINE TOOL SHOW, SEPTEMBER 6-17

Boeing KC-97 Stratotankers refuel Air Force planes in midair. And, to give the "flying tankcars" extra range, they're now equipped with huge wing tanks designed and built by Ryan Aeronautical Company, San Diego, California.

These tanks are outstanding for light-weight, high strength, and gas-tightness. In their manufacture, a Lodge & Shipley T Lathe plays an important part, machining aluminum bolting rings which join the three sections of each tank.

The alloy rings must be machined flat on mating surfaces to within .002″ as they must fit together without more than .004″ spacing at any point. This rigid requirement comes from the fact that the rings must prevent fuel leakage even when subjected to extremes in altitude and temperature.

The Lodge & Shipley T Lathe was a natural choice for this job. It has cut machining time on the bolting ring, 40″ in diameter and only 2″ long, from 1 hour and 15 minutes to 40 minutes, a saving of 46% in time alone.

A Lodge & Shipley T Lathe requires less floor space, less capital investment and gives consistently higher production rates with outstanding precision. For details, request Bulletin 215, The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

Lodge & Shipley

. . . your **LODGE**-*ical choice!*

does MORE work... MORE easily

new POWER FEED HEAD

U. S. Vertical Miller

Write for descriptive folder

Here's the new U. S. Vertical Miller with Power Feed Head – the head into which U. S. has built all the most wanted features without sacrificing traditional U. S. simplicity. Check its infinitely variable feed rate, its 800 pounds of down thrust on the quill, its supplemental hand feeds – it is the milling head that was designed to meet all shop needs.

Add to these the basic advantages of the U. S. Vertical Miller. You can easily see why it's the milling machine that "does more work more easily."

Detailed literature on request.
The U. S. Burke Machine Tool Division.
6 Brotherton Road, Cincinnati 27, Ohio.

more versatile
Feed infinitely variable from .002" to .008" while in operation

greater capacity
5½" power quill travel; 800 lb. down thrust

more convenient
Supplemental hand feeds

increased rigidity
Enclosed hard chrome plated quill with internal lock

THE U·S·Burke MACHINE TOOL DIVISION

Why you get top savings with Norton diamond wheels . . .

The "CROWN JEWELS" of carbide grinding

Buying diamond wheels calls for the same trust in the supplier as buying gem diamonds. Right there is where Norton's long leadership in diamond wheel development and manufacture is your best possible safeguard. Only Norton offers you such long diamond wheel experience to help you produce more at lower cost.

Check these reasons why Norton diamond wheels are the recognized "Crown Jewels" of the entire field:

Norton was first to introduce the three major diamond wheel bond types — resinoid, metal and vitrified.

The sizing, grading and laboratory checking of diamonds used in Norton diamond wheels is done in Norton's own plant.

Norton duplicates specifications for each wheel type and size with utmost accuracy for uniform top performance.

The line of Norton diamond wheels is complete, with sizes and types covering every field — carbides, stone, glass, ceramics, electronics, etc. — where diamond wheels are used.

Norton diamond wheels for every need are quickly available from full stocks in Worcester and five strategically located warehouses.

See Your Norton Distributor

for further facts on Norton diamond wheel performance and applications. Ask him for the 142-page illustrated booklet, *Grinding Carbide Tools.* Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products... to make your products better

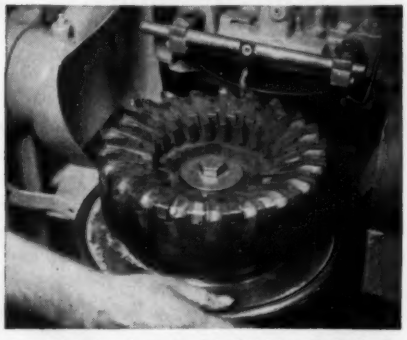
NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

W-1612

For Top Savings in Production Grinding of single point carbide tools, use Norton vitrified bonded diamond wheels. Combining fast cutting action with high resistance to grooving, they're also ideal for grinding chip breakers and for a wide range of precision grinding. This Norton engineered bond holds each diamond particle for maximum useful cutting action and long, money-saving wheel life.



For Top Savings in Multi-Tooth Grinding, Norton resinoid bonded diamond wheels assure uniform grinding to each individual cutter tooth. Their extra fast cutting action and long service life are big advantages in precision sharpening. Two bond types — regular, for wet grinding and B6, for dry applications.

For Top Savings on Especially Severe Single Point Tool Grinding and where long life is most important, Norton metal bond diamond wheels are recommended. They're also most economical for many other jobs — such as cutting-off sintered carbide blanks, glass, ceramics, germanium and stone.

NOW IS THE TIME . . . and here is the way!

To Reduce Manufacturing Costs with a . . .

SEVENTY FIFTH BULLARD ANNIVERSARY 1880 1955

CUT MASTER VERTICAL TURRET LATHE

. . . Model 75

AVAILABLE IN 26, 36, 46, 56, 66, AND 76 INCH SIZES

This revolutionary new design of vertical turret lathe has exclusive features never before offered on machines of this type . . . takes full advantage of the latest improvements in cutting tools and methods . . . truly the machine with a "built-in" future.

PENDANT CONTROL . . .

provides maximum machine control from a movable pendant station. Start and stop spindle; selection of speeds, feeds and directional movement of all heads in feed or traverse are quickly and easily accomplished from the Pendant. Interlocks and a stopall stick provide safety for both operator and machine.

SCREW FEED . . .

is provided for vertical and horizontal motion of all heads—to assure fine, smooth finishes with greater accuracy.

POWER INDEXED MAIN TURRET . . .

(Optional) Five sided turret for "run of the mill" jobs. Four sided turret for production jobs.

WE INVITE YOUR INQUIRIES—CALL OR WRITE YOUR NEAREST BULLARD SALES OFFICE, DISTRIBUTOR OR

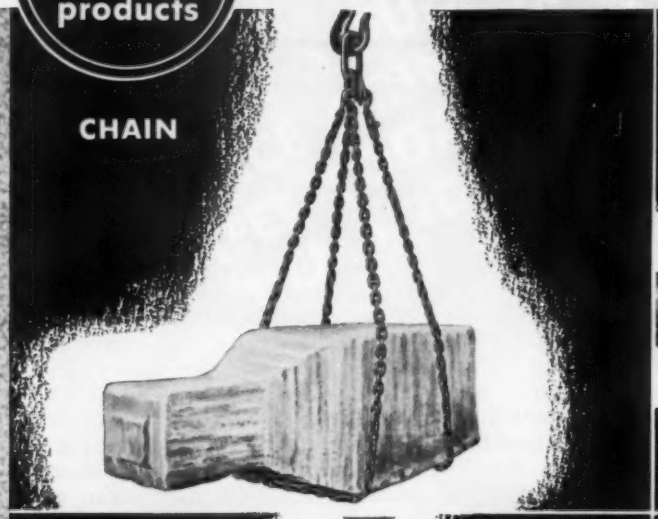
THE BULLARD COMPANY

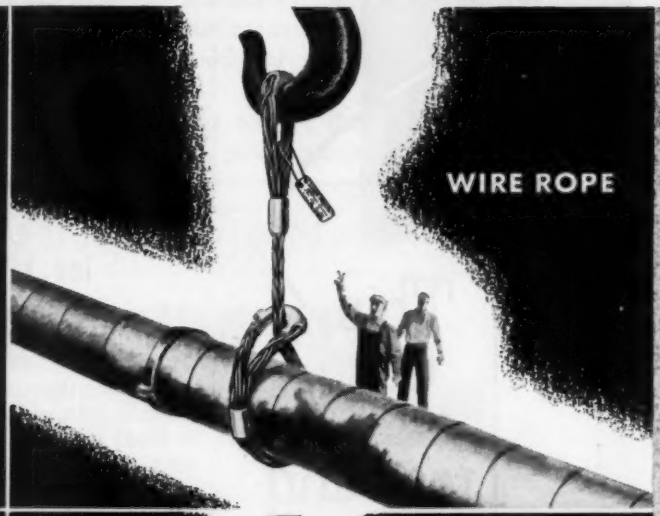
BRIDGEPORT 2, CONNECTICUT

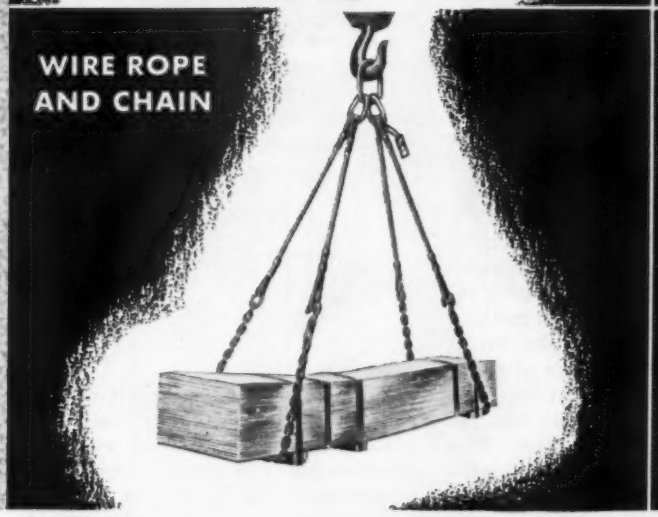
ACCO products

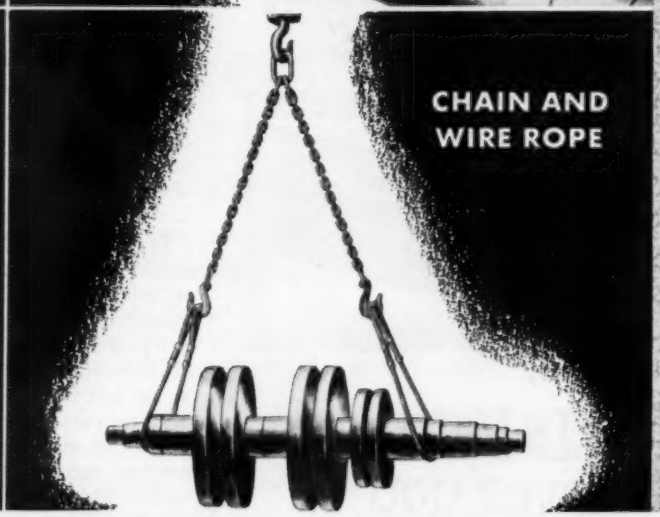
ACCO Registered* Slings–Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY









Different Loads Require Different Slings

–AND ACCO Registered* HAS THEM ALL!

• The shape or weight of a load, its temperature, protruding sharp corners—all these and other factors should influence the choice of a sling for any particular job. On some jobs chain slings are best. In others the characteristics of wire rope make it the first choice. And in still other cases a combination of wire rope slings and chain slings will provide the greatest lifting efficiency.

The safest slings available

Each component of an ACCO *Registered** Sling is made from the best materials procurable for its use. Each part is first individually tested—it must prove to have strength equal to or greater than the sling body. All hooks for ACCO *Registered** Slings are also Magnaflux tested. Then these components are assembled into slings according to carefully engineered designs that have proved themselves in rigorous field tests.

The completed sling is then individually proof-tested to twice the working load limit. Then and only then, is it awarded the coveted ACCO Registration certificate and the ring or the tag as the case may be.

Compare this quality control, precise manufacturing, and proof testing with the necessarily hit-or-miss methods used in producing "home made" or hand assembled slings. You'll see why ACCO *Registered** Slings are safer.

And ACCO *Registered** Slings cost less in the long run. Their precision design and manufacture insure longer life—cut your overall lifting costs. Your ACCO Representative has the facts. If you don't know who he is, please write our office at Bridgeport, Conn.

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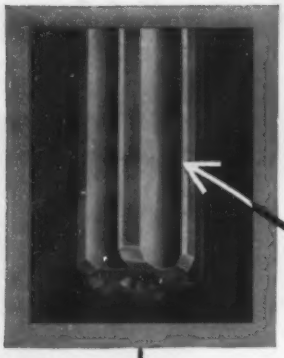

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Index Plunger

I was very much interested in the comments of Mr F Rogers (*AM*—Mar 14 '55, p 163) regarding the design for the index plunger and slotted plate which I submitted.

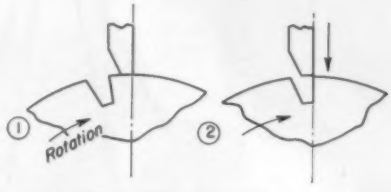
I am pleased that he agrees that this design is superior to the V-shaped slot and the slot with parallel sides, but I do not agree with his method for locating the plunger to the slot while indexing.

I have incorporated this design into a small dividing head which I have designed to build in our shop, and I have had excellent results with the experimental model by following this procedure:

I proceed with the indexing of the plate in exactly the reverse manner to that which Mr Rogers advocates. As I understand his method, the presence of dirt in the slot would still continue to be a source of error, as he lets the plunger seat by a lateral movement against the straight or radial surface of the slot. This seating movement must be in a radial direction or one of the greatest advantages of the design is nullified. I use the machine in this manner:

I turn the plate in the opposite direction to that which he advocates. The plunger may ride the periphery of the plate or may be held up from it by hand. When the straight side of the plunger is in exact radial alignment with the radial face of the slot, the plunger will depress and, as stated in my earlier article, it will scrape ahead of it any foreign material and seat itself clean and accurately.

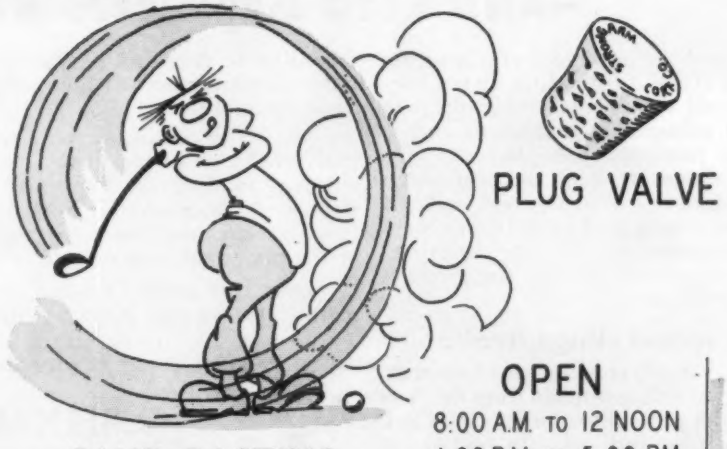
I believe that the question of wear on the straight side of the slot is largely academic, as wear is slight for the particular application. Wear will tend also to equalize itself in



all the slots in the plate. It can be minimized by hardening both the plate and the plunger, as we have done on one test model. The really important thing is that no amount of wear will produce looseness of

GRINETICS

By D G SMITH



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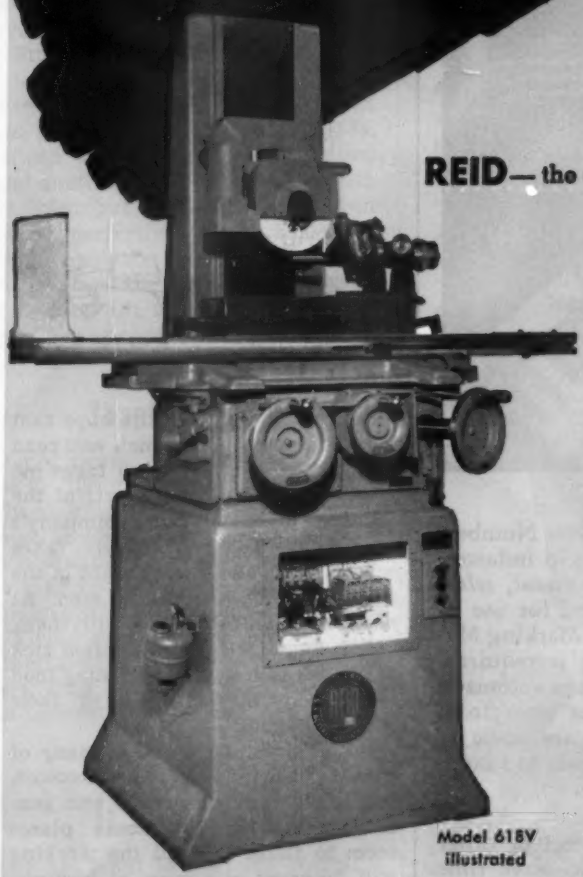

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. . . all mechanical units built around rugged one-piece column casting to insure permanent alignment of cross-slide saddleways and vertical headways. Column is mounted on heavy cast iron base for maximum rigidity and freedom from vibration.

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1 2 3 4 6 0
1 2 3 4 6 1
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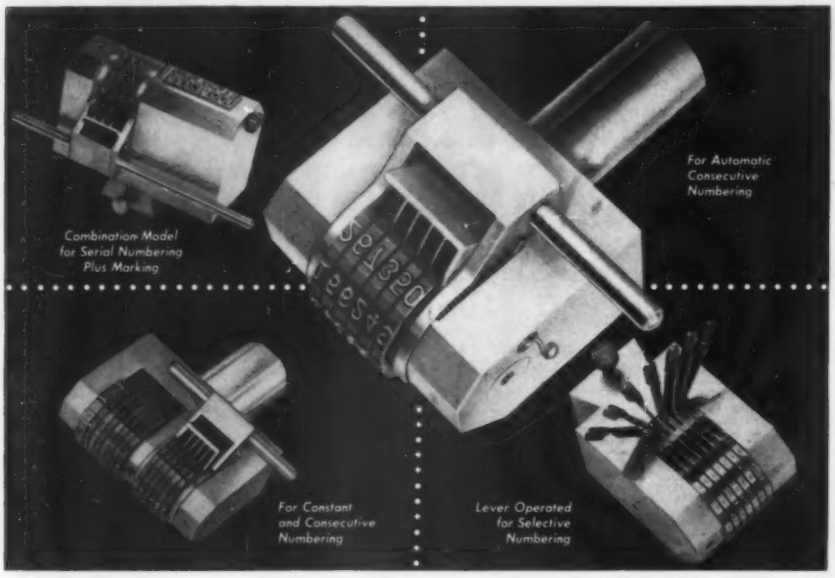
Precision

NUMBERING HEADS


Combination Model for Serial Numbering Plus Marking
For Automatic Consecutive Numbering
For Constant and Consecutive Numbering
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1 2 3 4 6 5
1 2 3 4 6 6
1 2 3 4 6 7
1 2 3 4 6 8
1 2 3 4 6 9
1 2 3 4 7 0
1 2 3 4 7 1
1 2 3 4 7 2
1 2 3 4 7 3
1 2 3 4 7 4

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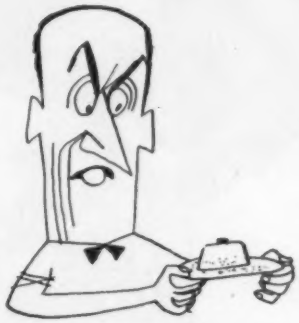
ORIGINATORS OF THE ROLL MARKING PROCESS

fit between slot and plunger, as long as the bottom of the plunger is not allowed to contact the bottom of the slot.

I might make it clear that this design was not intended to function as a power-operated indexing device, and possibly this is why Mr Rogers does not agree with my previous brief explanation of the mechanics of its usage.

I should be much interested to hear comments from other readers on this matter.

H J Gerber
Stillwater, Okla



Let's Eat

I am writing this in the hope that some top management men will read it and take note. My work takes me into many plants in all parts of the country to install our company's equipment. The job usually takes several days, and I work right in the shop with the customer's men. At noontime, naturally, I eat with them, and I am sometimes made real sick to my stomach by the disgusting food some companies provide in their shop cafeterias.

In our own plant, and in many of those I visit, the food is well cooked, reasonably priced, cleanly and generously served. But some plants seem to think that all the working stiff deserves is a mess of garbage. Obviously, I can't mention names, not even my own, but I have been served warm water with thick grease on top—called soup. I have found cockroaches and other vermin in different dishes. I've had half-cooked vegetables, rancid butter, unchewable meat, and dried-up pie at least a week old. I've had coffee so thin that it was only colored water, and so black and bitter that it must have been boiled for hours. And if there's one thing a man appreciates at lunch time, it's a real good cup of coffee. That alone would make the rest of a poor meal bearable.

It is to be noted that in such plants the foremen and office people always have a separate place to eat, and

sometimes when I have been invited into their place there is a vast difference in the quality.

Serving bad food is a sure way to invite labor troubles, and if there were a fixed rule that the general manager had to eat in the men's cafeteria once a week on unspecified days, there would soon be a change for the better. It is quite true that the way to a man's heart is through his stomach. If management would see to it that their men are well fed, they would soon find they had developed a group of contented men willing to put their hearts into their work.

And while we are at it, let's have a little more imagination in planning menus. On blazing hot days, even he-men appreciate a sandwich and a salad and a glass of iced tea, instead of roast pork and potatoes. And another thing; I like fish—when it's fresh; but when it gets old, even though perfectly good, it makes the whole room smell bad. Let's have a better fan in the kitchen so the smell of cooking fish, and cabbage, will not spoil our appetites.

Name withheld

Thank You, Sir

Compliments on your special report, "Train Diemakers—or Die." The shortage of tool and die makers must be faced from both sides, since it necessitates inducing young men to take up what we know to be an underpaid trade, by comparison.

Please send me reprints and any other articles you have on the subject, from which I could condense an interesting discussion.

William A Zanker
East Rutherford, NJ

It Does Work

I do not want to hurt Mr Waring's feelings, but after reading his letter (AM—May 9 '55, p 98), I would like to say that I fear he is a rock-ribbed conservative. I felt somewhat the same way when I first came across simplified drafting, but I soon learned its advantages and am now a staunch supporter of the idea. It takes a little getting used to, but once you get the idea you wouldn't change back to the old way.

I agree with him that one of the drawings is incorrectly dimensioned but this just strengthens the argument in favor of simplification. Such a mistake couldn't have occurred if the drawing had been made the simplified way.

George Helmsley
Cincinnati

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Among the most important factors in maintaining the efficient production pace set by Automation are sharp and accurate cutting tools which can well be termed the "life-line" of Automation. Cutters and tools, machine ground on an Oliver ACE, assure smooth and efficient operation . . . eliminate production "interruptions" and costly rejects caused by dull and inaccurately ground cutting tools.

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An economical Oliver ACE in your toolroom will cut time lags to the bone . . . its simplicity of design and operation makes economy of motion and fast grinding certain—only two fixtures required. The ACE is easy to set up . . . needs only a small amount of floor space . . . requires less outlay of dollars.

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The efficient ACE is easy to operate . . . requires no computation . . . direct reading for clearances reduces fatigue and eases operators' jobs in grinding the most difficult cutters.

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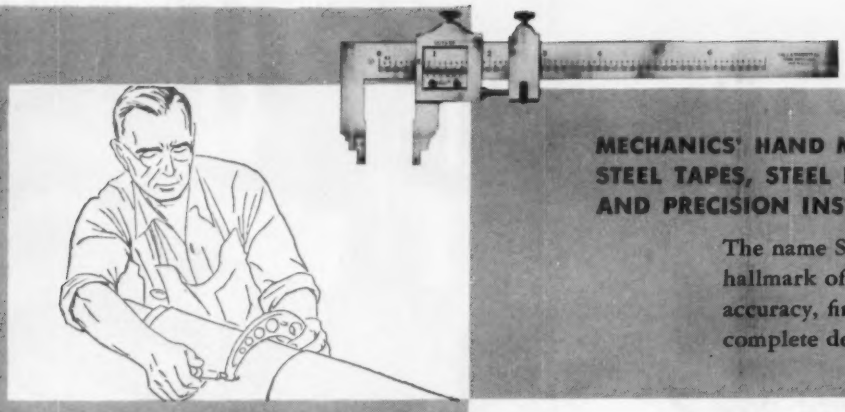

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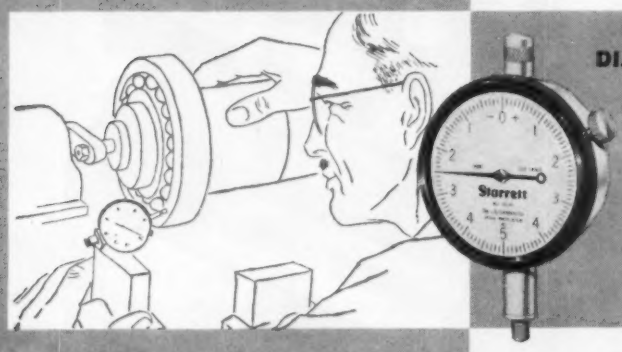

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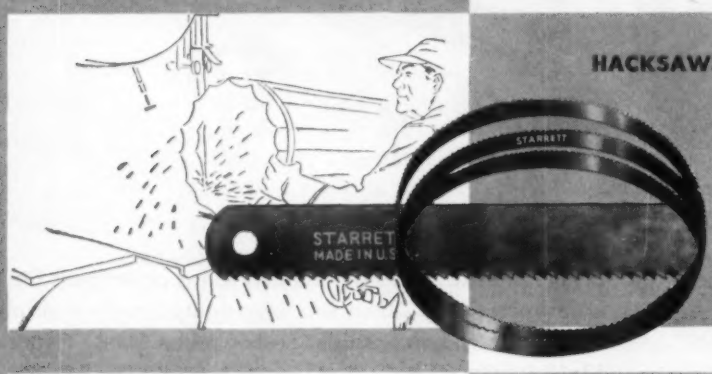

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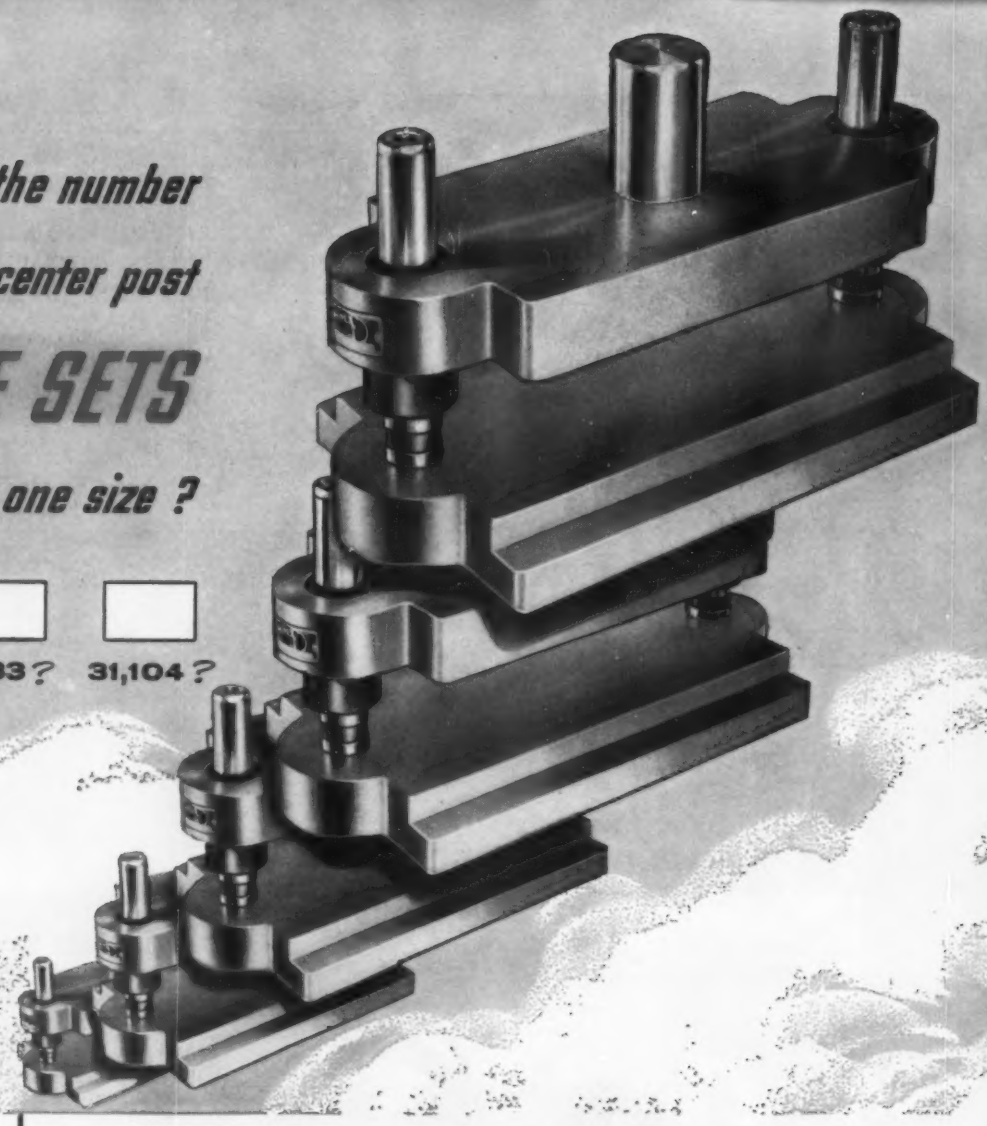
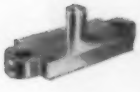
DANLY DIE SETS

in stock–in just one size ?

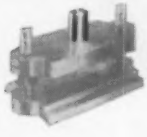
67 ? 575 ? 1433 ? 31,104 ?





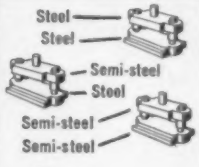
3 different punch holder thicknesses

3 different die shoe thicknesses



6 shank size variations

4 bushing type variations



3 different material combinations

16 guide post lengths in each of 3 different styles to choose from

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DANLY

DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

Spot News of Metalworking . . .

Ford will build a new engine manufacturing plant near Lima, Ohio, as first project in its new $625 million expansion and modernization program. The new plant will supplement facilities at Dearborn, Mich, and Cleveland and will be ready in 1957.

General Electric has licensed Fiat Works at Turin, Italy, to build two models of its J47 jet engine and to manufacture spare parts and to overhaul the engine. Fiat production will go to the air forces of NATO countries. GE has built 34,000 J47 engines.

Around 42 spar milling machines and 42 skin millers are about to be bought by the Air Force for its reserve machine-tool program. Farnham and Onsrud are reported to be getting the bulk of the spar-miller business.

119 Cleveland companies employing 55,000 workers will close for a two-weeks' vacation period this summer, an Associated Industries of Cleveland survey shows. 51 companies with 7000 workers will shut down for one week, but 95 firms will stagger the vacation time of employees.

Independent foundries believe GAW would spell death for most of them. Reason: When business is low, they customarily keep all employees on a 3-4 day week basis, but they could not afford a fifth day. They fear auto makers will do more and more of their casting work in their "captive" plants under GAW.

Atomic-dust vacuum cleaners with special renewable filters will mop up dangerous particles as small as a ten thousandth of an inch at Britain's Harwell and Risley atomic-energy establishments. The Hoover, Ltd, units have extra-smooth flexible hoses, one cloth filter, and one resin-impregnated wool-pad filter — replaced every two to four weeks.

Management is prohibited from subcontracting work when it causes layoffs, according to agreement between Cleveland Pneumatic Tool Co and an independent aircraft-workers' union. Factory employees own 49% of company's stock through a trust. Balance is owned by a trust for office workers.

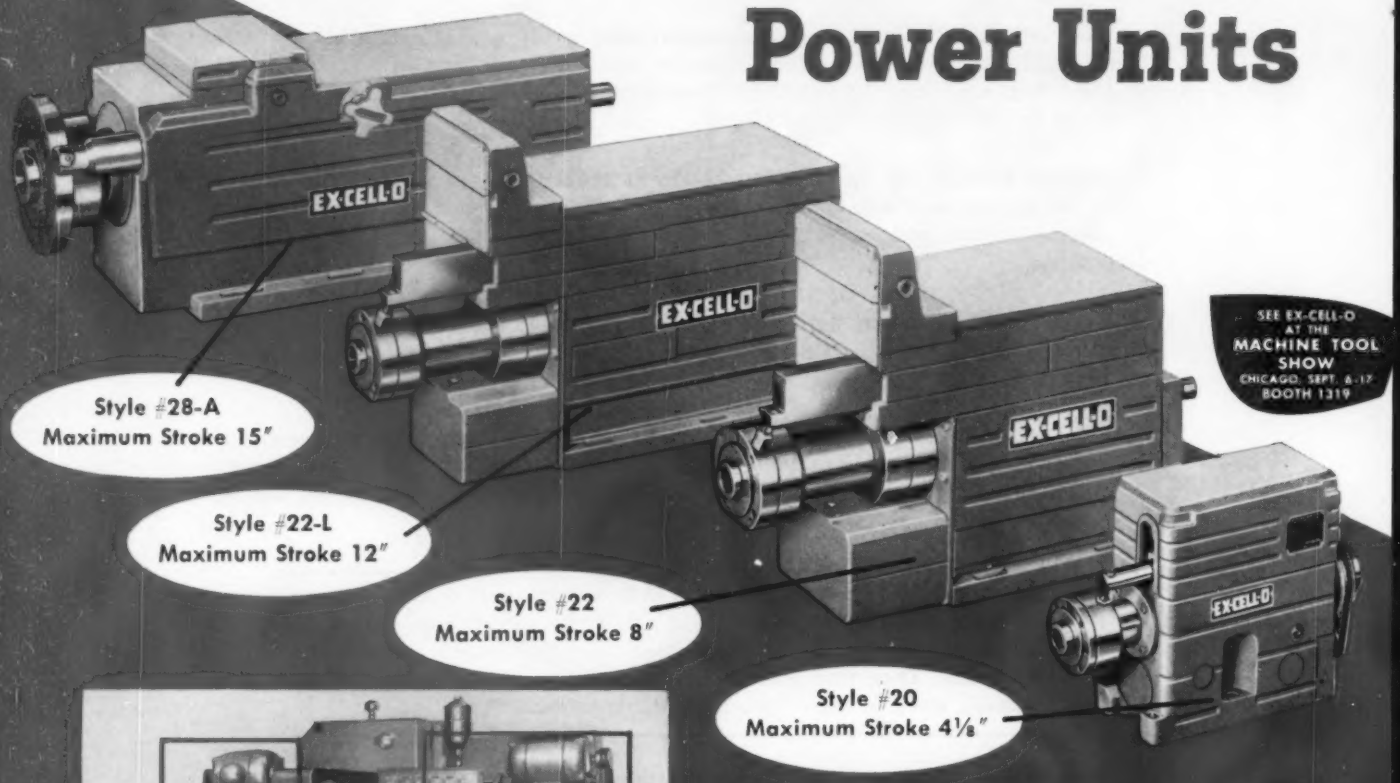
Aerovox Corp will operate Project Tinkertoy in Arlington, Va, to broaden experience and know-how in use of modular design for military equipment. Tinkertoy was National Bureau of Standards development for Navy electronics, based on modular subassembly design and mechanized production line. Wafers containing resistors and capacitors build up into modules, and modules build up into electronic devices. Aerovox will use Kaiser Electronics Div personnel, who are familiar with modular concepts.

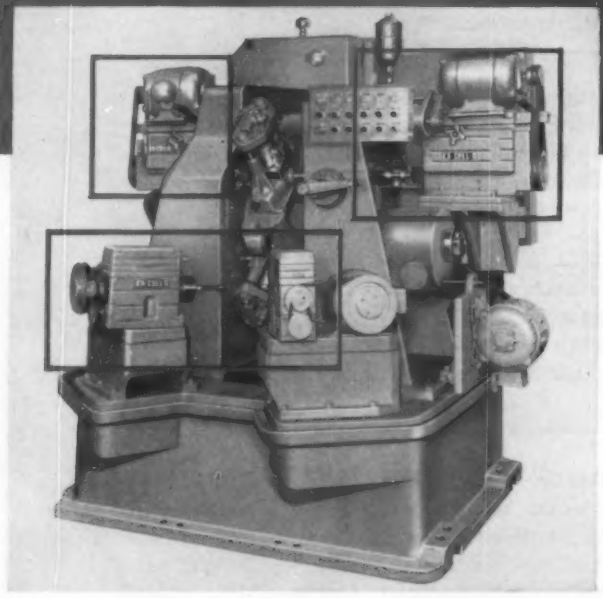
Pure oxide coatings for high-temperature metals and ceramics have been announced by Norton Co. Uses are potentially jet engines, other high-temperature devices. Advantages are insulation to 3600 F, high hardness, and uniform composition. "Rokide A" is aluminum oxide, and will be licensed on an $8 royalty per sq ft, for 0.010-in thickness. "Rokide C" is silicon carbide, for molded graphite parts.

FOR AUTOMATIC CYCLES IN PRODUCTION MACHINES:

Ex-Cell-O Quill-Type Power Units

XLO
EX-CELL-O for PRECISION





This special machine with automatic indexing fixture core-drills piston pin holes and drills angular oil holes. It uses six Ex-Cell-O Power Units (shown without belt guards) operated from a central push-button station.

Ex-Cell-O Hydraulic Power Units feed and rotate cutting tools in easily controlled automatic cycles. They actuate single tools or multiple spindle heads for such operations as drilling, reaming, counterboring and spot-facing. Hydraulic operation provides smooth, powerful movements.

A machine utilizing Ex-Cell-O Power Units can be very simple, with manual loading and clamping. Or it can be designed with work handling equipment for automation . . .

For complete information, including specifications and installation drawings, ask your Ex-Cell-O Representative or write Ex-Cell-O in Detroit.

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55-13

Washington . . .

Slow US Air Development . . .

Dust is settling in the Washington rumpus over Soviet air-force progress. The experts now seem to agree that the Reds went into production with the Mig-17 while we dallied, developing a comparable supersonic fighter, the F-100. In addition, the Russians may have gone almost two models ahead of us in top-flight day fighters, by starting production of a Mig-17 successor.

The Russians are also almost up to us in long-range bombers, even though they started production 18 months after the first B-52 came off our lines.

Soviet progress with supersonic day and all-weather interceptor fighters may spark a switch in US bombing tactics. Up to now, strategy has been to get our big bombers over targets at night or in bad weather to evade fighter attack. Now we have to be ready for a potent radar-fighter defense in any weather and around the clock.

The new appraisal of Russian air power in relation to our own has played up a serious weakness in our military aircraft program: A dangerous lag in the development cycle. It takes the US about eight years to shift a plane from first design to combat-readiness. Apparently, the Reds are making the same shift in three years less. Reason for this lag, according to some experts, is two-fold. First, the off-again-on-again habits in the Air Force (there have been four big policy reversals in four years for the B-52). Second, inadequate backing in tooling, manufacturing, and management support for the aircraft industry's design engineers.

Premiums for Mobilization . . .

Defense Department has yet to award a contract involving price differentials for maintenance of a broader mobilization base. Last December, the Pentagon issued its much-publicized directive authorizing premium prices to firms the services wanted to keep in military production, even though they couldn't meet low bids of competitors for military orders.

Actually, the directive covered only procurement of some 970 top-priority hard goods. During the first three months of this year, the military services let 38 contracts valued at $302 million for such equipment. Included were 15 contracts totalling $21 million for "new" procurement—that is, items never produced before by the contractors. Among the firms: Eastman-Kodak, Bendix, Caterpillar, Lewyt, Minneapolis-Honeywell, Mergenthaler, Ryan Aircraft.

"New Look" for Armament Makers . . .

Latest Pentagon listing of top military contractors reveals that the US munitions business has undergone some facelifting in the past two years. During 1950-53, the big armament makers showed up as a horizontal slice of American heavy industry, representing a wide range of companies and industries. But since then, they have become a more restricted group, almost a special segment of industry—with aircraft and electronics firms providing the backbone.

Many machinery and automotive firms have been eased out of the armaments field, or have made military business a much smaller part of their total volume. The trend stems not so much from the general drop in military spending, but from the big cutbacks in procurement of tanks and other automotive equipment and the new emphasis on jet planes and guided missiles. Another factor: The tendency of some prime contractors to hold back defense subcontracts.

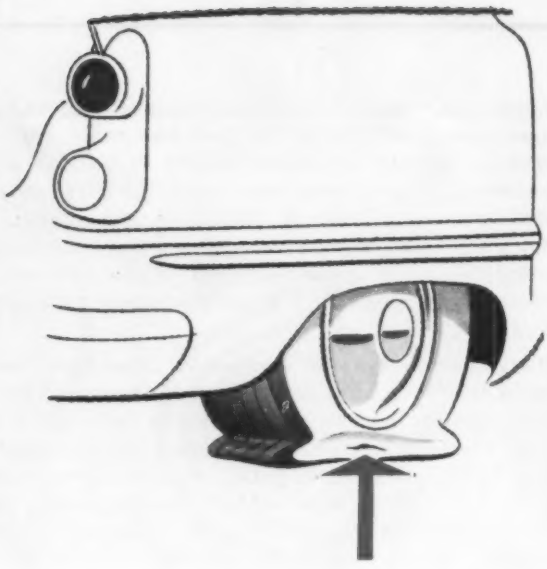
This is what's happened in some capital-goods industries: Automotive — percentage of output for military has dropped from 20% in 1952-53 to 5-10%; general machinery and industrial equipment—20% to 10%; machine tools—55% to 15%; farm, construction, and mining machinery—25% to 5%. In aircraft and electronics, however, the defense take is just about the same—roughly 90% of total production for aircraft, 50% for electronics.

More than at any time since 1945, the munitions business has settled down to a fairly static group of industries and companies. Included are firms almost entirely on military work—like Boeing, United Aircraft, North American Aviation, General Dynamics, and big companies like GM and GE, whose defense business makes up less than 10% and a bit more than 20%, respectively, of total sales.

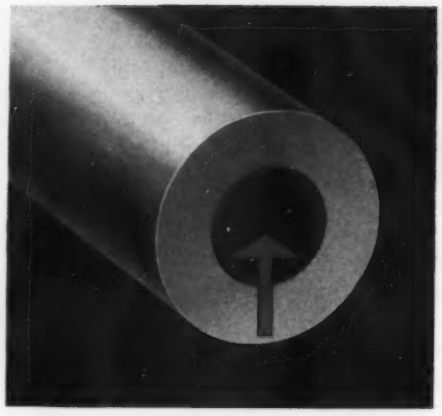
GAW Isn't the Last Word . . .

The big 1955 wage-settlement pattern will come from the steel-industry negotiations. The agreement in the auto industry for a modified guaranteed annual wage is a special deal that won't be pushed now. But the steel industry and giant United Steelworkers Union are talking only money — and what comes out will be the basis for settlements by steel fabricators and other related industries.

In steel, the settlement is expected to go above 10¢ without much trouble. But USW President Dave McDonald is under pressure from two points to get more than that. First, he's out for a rise that can be favorably compared to the 20¢ boost won by his rival, auto-union President Walter Reuther. Also, there's an election for steel-union vice president coming up soon with McDonald's candidate challenged by another union official. McDonald must bring home the bacon to be assured of union support for his man.



a hole here is a letdown . . .



a hole here is a lift

Crucible Hollow Tool Steel Bars can step up output on most any production line where ring shaped or hollow parts are made. Why? Simply because the hole is already there. There's no need for drilling, boring, or hole-sawing. And that's where you save production time, increase machine capacity, and avoid scrap losses!

Crucible's famous tool steel grades are available to you in hollow form, in almost any combination of OD, ID and length. In fact, your local Crucible warehouse can give you immediate delivery of these popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 air-hardening, and NU DIE V hot-work tool steels.

Ask your local Crucible representative how you can save time and money by using Crucible Hollow Tool Steel Bars. Call him today, at our nearby Branch Office. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Detroit . . .

Ford's Economic Package . . .

It's not precisely as large as auto-workers-union boss Walter Reuther termed it. The pack, according to union technicians' calculations, runs over 20 cents per hour per worker. But a nickel of that is not "new" money.

Here's how UAW figured it: 5 cents an hour goes into two trust funds for GAW (union term) or supplemental unemployment benefit plan (company phrase); Annual Improvement Factor, 6.2 cents; pension hikes, 4.5 cents; wage inequities, including 8-cent raises for some skilled workers, 1.3 cents; broader vacations, 0.2 cents; health insurance, 1.2 cents; triple time for holidays worked, 0.8 cents; increased shift premium pay, 0.8 cents.

That's an Even 20¢ . . .

UAW reckoned that the "pyramiding effect" of AIF, a more generous cost-of-living formula, a seventh paid holiday, etc., would take the total beyond 20 cents. But 5 cents of that is not a brand-new gain, since a 5-cent AIF already was built into the contract. The total new economic pack, then, would run about 15 cents, assuming other calculations to be correct.

Significantly, no across-the-board pay boost was crammed into the pact. UAW had asked a 5.3-cent "catch-up" increase, but gave that up in bargaining. The 6-cent AIF (or 2½% of base pay, whichever is greater) is a blanket boost, of course; but except for skilled classification increases, there was nothing in the pack that could be catalogued as a straight pay raise.

That illustrates how far Reuther will veer away from the old-line unionist's pitch for money on the line. Instead of pure bread-and-butter boosts, Reuther went in quest of a principle that may not pay big right now, but will rate as a tremendous gain later on when UAW expands on the principle.

Reuther Hoisted the Warning Flags . . .

Ford granted the principle "upon which we are going to build (GAW)," he said. "What we are doing is laying the foundation for the kind of security we think automobile workers and their families are entitled to . . ."

The "foundation" will be the $55-million fund Ford will raise at the rate of a nickel an hour. What comes later, when the 3-year contract expires? You can guess. Ford's plan now grants a maximum payment to a laid-off worker of 65% of take-home pay for the first four weeks of any layoff (after a waiting week), up to eight such weeks per year (but the eight weeks not to run consecutively) after the fund reaches 49%, and the maximum duration of total benefits is 26 weeks with top payment after the first four weeks of a layoff of 60% of weekly after-tax wages. UAW wants 100% payments after 52 weeks. Provided the foundation is firm three years from now, UAW can add a lot to it.

"A Great Internal Debate" . . .

Preceded Ford's decision to offer the modified GAW, John Bugas, industrial relations vice-president, pointed out. Bugas said the company had to avoid "getting into . . . unlimited liability and unpredicted costs . . ." That was done, he added. Obviously, some outstanding conciliatory work was accomplished within the company, because the anti-GAW forces inside Ford are known to have included some top-echelon executives who were not obliged to accept dissuasion; ie, their influence was and is great enough to enforce any decision they might reach.

Besides GAW Expansion . . .

Later on, you can expect a firm UAW push for another major goal: 40 hours' pay for 30 hours' work. That is a pet project of Carl Stellato, Ford-Rouge Local 600 president, who came out of the bargaining with a few holes shot through his platform. His raucous local, biggest in the auto union, wanted no more long-term contracts. It wanted a one-year pact, two years at most. It had to take three. It wanted immediate pay hikes instead of principle. It got a lot of the latter, not nearly as much of the former as it sought. And when Stellato, trying to steal Reuther thunder, raced from the negotiations to the Rouge plant to try to make the first announcement of terms, he was roundly booed.

To Top That Off . . .

Tool and die workers, who wanted 30-cents-an-hour pay boosts (least likely to be laid off, they were unimpressed by GAW), wildcatted along with crane operators and maintenance men. That was predicted about 12 hours before the settlement by a pair of tool and die representatives who paraded around the halls of the hotel in which negotiations were being conducted. Said they: "You watch tool and die. No matter what happens here, tool and die is staying out." The few reporters they spoke to discounted the warning. Reason: both men were in advanced negotiation with a whisky bottle. But they were right.

At Press Time . . .

The Rouge was operating on half a cylinder. Wildcats and refusals to work overtime had cost Ford about 25,000 cars and trucks. But Reuther and Stellato and 138,000 Ford employes who accepted contract terms (or at least did not want to strike over them) were sure to bring the dissidents back into the fold.

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Machine Tools . . .

Air Force to order 42 spar millers . . .

Orders for some 42 spar milling machines are about to be placed by the Air Force for its reserve machine-tool buying program.

Farnham Division of the Wiesner-Rapp Co Inc, Buffalo, and Onsrud Machine Works Inc, Chicago, are reported to be scheduled to get the bulk of the business.

This will be the first batch of orders coming out of the Air Force program. The second batch will consist of about 42 skin milling machines.

Soviet reinstates British order . . .

Moscow is said to have reinstated an order for six huge 8-inch floor-type horizontal boring mills with a British machine tool builder.

Soviet officials originally ordered 26 of these boring mills, but this spring they cancelled the entire lot, according to Washington reports.

Washington still is not reconciled to the wisdom of permitting any of these machines to go into Soviet factories. Department of Commerce men regard the machines as strictly strategic and believe that they will be used to produce military goods.

Only 25 of these machines have been built in this country since 1946. Eleven of them went to Europe. American builders produced and shipped 16 of them to Russia from 1938-1945 when Russia was our friend and military ally.

Brown & Sharpe pioneers . . .

Brown & Sharpe, in setting up facilities for making its new No 00 automatic screw machine, is pioneering in manufacturing methods (*AM* June 6 '55, p 188) in the machine-tool-building industry.

Never in the history of Brown & Sharpe, and probably in the history of the industry, has so much capital been spent for production capacity to make a single line of machine tools.

The principle is a modification of the technique used in the automobile and appliance industries. Special-purpose machinery has been installed. Mechanical handling is extensively employed.

All tooling has been designed so that much of the skill formerly required of the operator has been transferred to the machine. Target-type milling fixtures make unnecessary the layout of castings.

As soon as a piece is completed in one machine, it goes to the next. A machine bed received from the foundry can be completed in one week, compared with 16 weeks previously.

A tool-control system provides for removal and reconditioning of all cutting tools after a predetermined number of workpieces have been machined.

Many benefits from new policy . . .

Brown & Sharpe management readily admits an element of risk in this new setup, but it is a calculated risk. Dividends expected from the set-up:

1. **Manufacturing flexibility** far exceeding anything heretofore possible. Production can be increased quickly and near-term delivery dates met despite a large influx of orders.

2. **Ability to make machine tools in great quantities** quickly in case of a national emergency.

3. **Experience factor required of operators** has been reduced more than a year.

4. **Unit time of machining parts** is sharply cut by straight-flow production and minimum movement of work between operations.

Entire new production line for the screw machine will not be completed for 1 to 2 years.

European Show every other year . . .

European Machine Tool Exhibitions, held each year for the past four years, will be staged every other year beginning with the fifth in the series in Paris in 1957. In deference to the American show this year in Chicago and to the British show at Olympia, London, next year, there will be no European show in either 1955 or 1956.

To be eligible to participate, machine-tool builders must agree not to show their machines either directly or indirectly in the same year as the show at any fair in the country of a member of the European Committee. Virtually every nation in Western Europe is a member of the committee.

Red Rumblings of breakdowns . . .

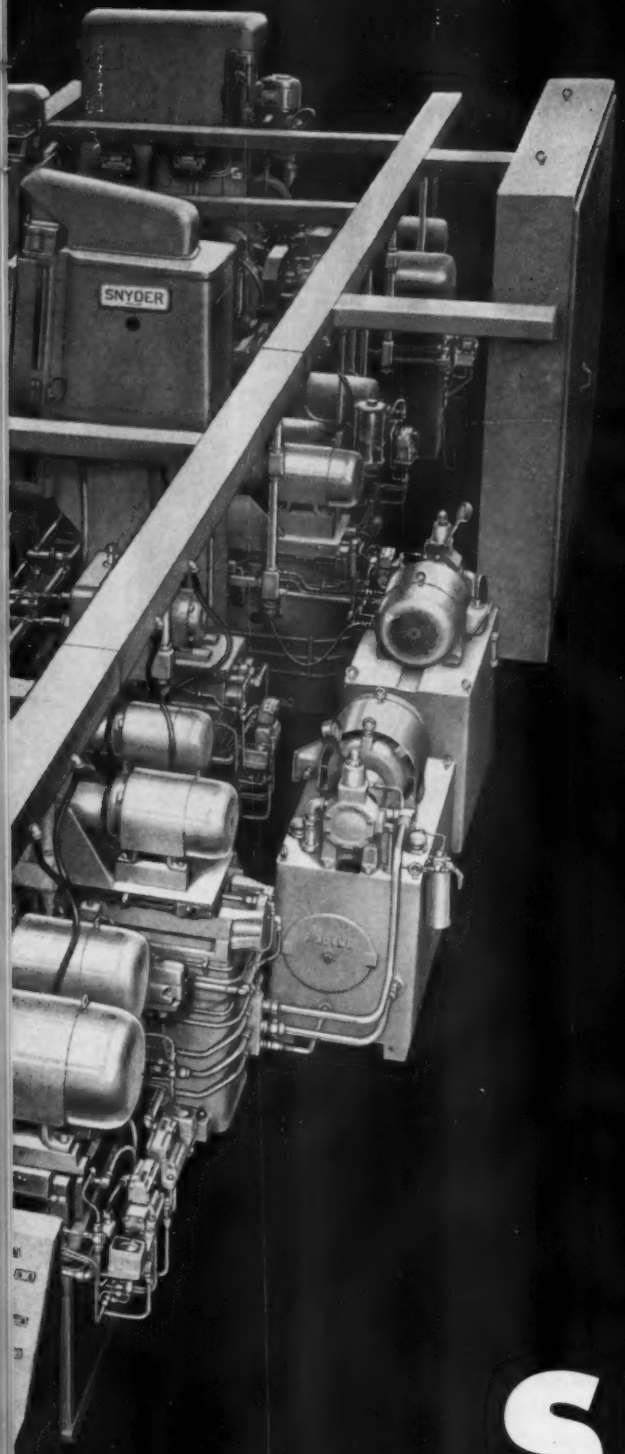
Russia has accused its ministry of machine tools and its ministry of heavy machine building of backwardness in producing forging machines, heavy presses, and other machines. The Communist party newspaper, Pravda, charges that, "Production of equipment for hand forging of metal still predominates in the USSR. The heavy-machine-building industry is lagging in producing powerful hydraulic presses. The machine-tool industry has not yet mastered manufacture of forging and stamping presses, for which blueprints were drawn 3 to 4 years ago. Not enough attention is being given to production of new casting equipment, multiposition automatic and semi-automatic lathes, and new types of gearcutting machines."

BF

SNYDER—AUTOMATION

At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

LEADER FOR 30 YEARS



Presents

SNYDER SPECIAL

22-STATION automatic transfer machine for processing cast iron clutch housings; which drills, rough and finish bores, mills, saws, taps, spot-faces, counterbores and chamfers, performing a total of 110 operations on various surfaces or holes of various dimensions. Production, 124 cycles an hour at 80% efficiency.

UNUSUAL FEATURES: At Station 1, a 2" breather hole is trepanned from solid metal and finish bored with one tool. At Stations 8 and 9, a section of transfer rails cam-linked to milling units, drops to bring work piece into line with cutters. At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

SNYDER

TOOL & ENGINEERING COMPANY
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30 Years of Successful Cooperation with Leading American Industries

GILLETTE SAFETY RAZOR COMPANY, South Boston, Massachusetts, has been using *Texaco Cleartex Oil B-1* as a dual purpose oil—cutting fluid and machine lubricant—for the past five years in its Brown & Sharpe and National Acme automatic screw machines.

This has resulted in long tool life, fine finish and protection for the machines. *Texaco Cleartex Oil* has helped maintain a high level of production and a low level of unit costs.

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do *all* your machining better, faster and at lower cost. A Texaco Lubrication Engineer will gladly help you select the right ones for your operation.

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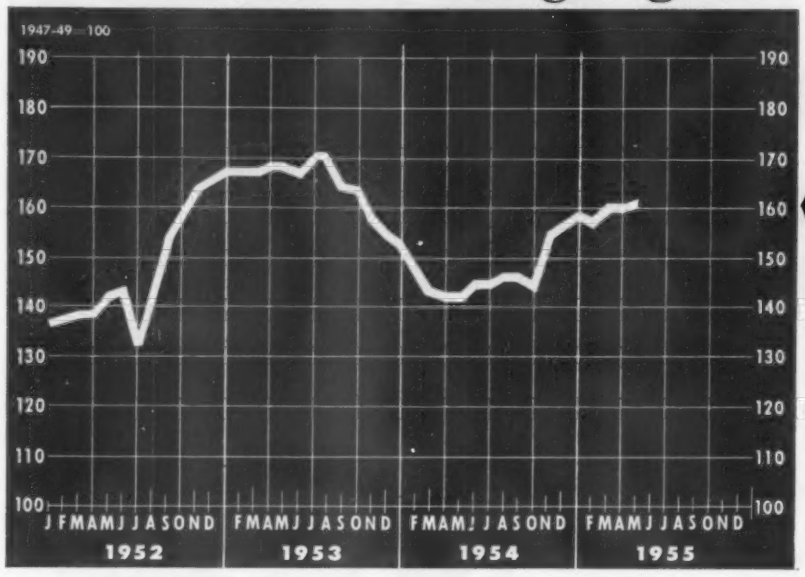
TUNE IN . . . TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR on television . . . Saturday nights, NBC.

Gaging Metalworking . . .



Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAY '55(*)	APR '55(p)	MAR '54(r)	APR '54
Total Index	**161**	**160**	**158**	**146**
Machinery	130	126	126	
Electrical Machinery	186	185	163	
Autos	164	157	107	
Other Transportation	260	264	286	
Other Metalworking	133	131	122	

(*) Estimated (p) preliminary (r) revised

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

New peacetime record set . . .

Metalworking production was maintained on a higher plateau throughout the first half of 1955 than at any other period in peacetime.

It was surpassed only in World War II and for a short time in 1953, when defense production was at its height.

Metalworking in fact has come up to the summer without perceptibly slackening its pace.

But don't look for this phenomenon to continue without a bit of a dip. There will be a dropping off the first half of July, if for no other reason than widespread company shutdowns for vacations ranging from one to two weeks.

Retooling to cut car assemblies . . .

Beyond that, automobile manufacturers will do most of their retooling in the third quarter in preparation for production of 1956 models. Car assemblies, dipping especially in August, should be back up to a high level in the fourth quarter.

Best guess on automobile assemblies: 55% of year's total in first half, 45% in second. Final ratio may be nearer 60%-40%.

Many segments of Metalworking are showing strength. Farm implements, tractors, construction machinery, housing products, home appliances, production equipment are all doing OK.

Castings people doing well . . .

Gray-iron-castings people have about a five-months' backlog. But much of the business on their books is for fourth-quarter delivery, leaving open spots in the third quarter.

Production is currently about 1 million tons a month. Year's output is estimated at 13 million tons. That would make 1955 one of the industry's best years.

West-Coast gray-iron foundries are in strong position, mainly because many foundries went out of business the past two years and there are fewer companies to handle existing volume. More than that, most foundries have modernized their entire operations.

Sales of forgings comfortably higher . . .

Drop-forge companies are well ahead of 1954. Through April, shipments were 11% better than last year. Of still greater significance, orders booked were 86% above the 1954 volume.

The industry has about 2½ months' business on hand at current operating rate, which is up 15% compared with the beginning of the year.

Incoming orders for forgings are satisfactory and represent a good cross-section of Metalworking.

Steady production is in sight for the balance of the year.

Steel deliveries to continue during vacations . . .

Steel may soften during the summer. Nevertheless, it will be one of the best summers on record.

Deliveries are not likely to lag much in the vacation period. Even if plants are shut down, they will continue to take in tonnage to build inventory.

It is not so much a case of users not having enough steel as it is in anticipation of higher prices.

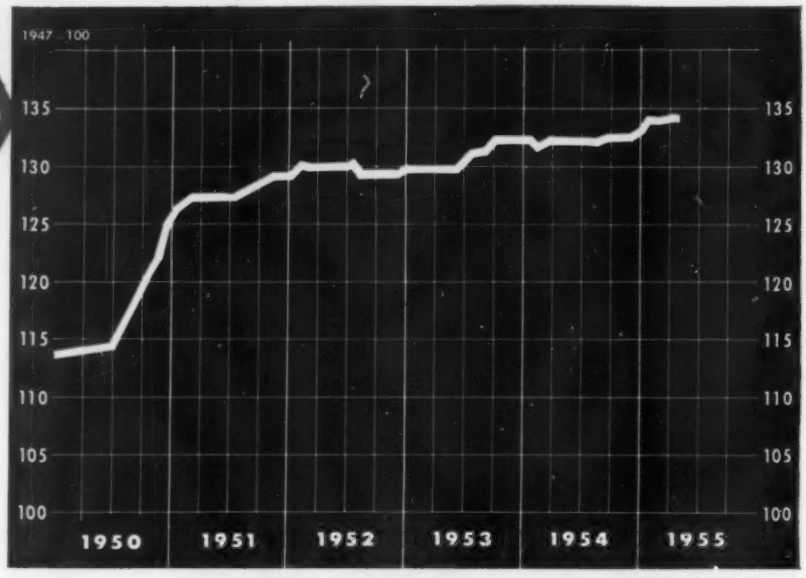
Steel customers are convinced that increased labor costs will be passed along to them in price advances.

Cold-rolled coil sheets is a hard-to-get item. But there is an ample supply of the same product cut to size.

Gaging Business . . .

Price Index

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total Index	**134.5**	**134.3**	**134.2**	**132.6**
Metalworking Machinery	**146.3**	**146.2**	**141.6**	
Other Machinery exc. Electrical	**139.2**	**138.9**	**137.5**	
Electrical Machinery	**131.6**	**131.6**	**131.7**	
Fabricated Metal Products	**130.6**	**130.5**	**128.9**	



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

Outlook perking up again . . .

Business in general is stimulated by the fading out of the possibility of a disastrous major strike in the automobile industry.

Outlook for a strong second half is enhanced by the promise of uniterrupted automobile production, except for the retooling period during late summer.

It's hard to find a really depressing note anywhere. Personal incomes are at a peak. In April they hit a record $295-billion-per-year rate.

Money's easy . . .

People thus have plenty of money and are spending it. Retail sales of all kinds of commodities are the best testimony to that phenomenon.

This buying urge is expected to continue with little or no decline.

Seasonal influences are bound to have a certain dampening effect the next 60 days, but this is normal, and allowances have been made.

One thing to count on for sure — inflationary factors will be at work from here on for some time. The "package' won by automobile workers will cost Ford and other motor-car makers a considerable amount of money. Other metalworking firms and steel mills will be faced, too, by the necessity for paying more for labor.

Pressure for higher prices is likely to be strong as a neat solution for the dilemma in which some manufacturers will find themselves. On the other hand, competition is so keen in many metalworking lines that managements will think twice before they slap on price increases.

More automation . . .

Saddled with higher labor costs, many companies are likely to be shopping for cost-cutting equipment, if anything. Union labor's handsome gains will stimulate the trend toward automation.

Expansion is the talk in many segments of metalworking. It is true in steel, in aluminum, and in consumer goods. The automotive industry is a prime example of the need for more capacity to meet competitive conditions.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	143.3	143.4	124.5
Steel ingot production (thousand tons)	2,334	2,312	1,746
Electric power output (million Kilowatt hours)	9,537	9,976	8,236
Production of automobiles and trucks	166,146	209,939	119,688
Engineering construction awards (*Eng. News-Record*, millions)	$378.3	$324.1	$325.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	364	393	281
Vacuum cleaners sales (thousands of units)	244	258	221
Washers sales (thousands of units)	313	371	259
Household electric ranges sales (thousands of units)	109	130	93
Radio production (thousands of units)	1,160	1,482	745
Television production (thousands of units)	583	831	458
Gear sales index (1947-49 = 100)	179.8	172.8	158.2
Foundry equipment new orders index (shipments, 1947-49 = 100)	178.6	163.6	125.3

*Seasonally adjusted

First in performance for automatic muscle jobs like these...

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Spacemaker CYLINDERS

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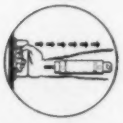

LIFT

- Raise
- Lock
- Brake
- Press
- Spin
- Turn
- Grind
- Weld
- Lower
- Squeeze
- Bend
- Coin
- Saw
- Tap
- Index
- Braze
- Open
- Time
- Blank
- Cut
- Broach
- Drill
- Sequence
- Close
- Snub
- Form
- Pierce
- Feed
- Mill
- Convey
- etc.

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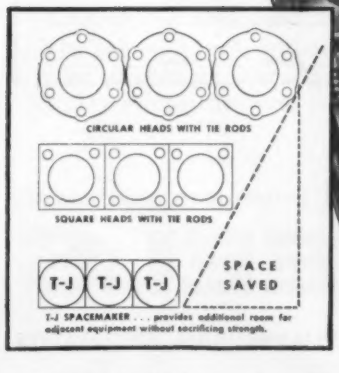
T-J Spacemaker Cylinders get first call for an ever-widening range of power movement jobs in industry today—because they're so advanced in design . . . so efficient and dependable in performance. Wide selection of styles and capacities. Check your needs now! Send for bulletin SM-454-2. The Tomkins-Johnson Co. Jackson, Mich.



T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

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Foundries report ultimate tensile strength as high as 190,000 psi in investment castings of Armco 17-4 PH Stainless Steel. This precipitation-hardening grade is easy to cast. It fills thin sections and details nicely, surface finish is good and tolerances small.

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NUMEROUS SUPPLIERS Armco does not make castings. If you are interested in high-strength, low-temperature hardening castings with high corrosion resistance, just fill out the coupon. We'll send you a list of suppliers of investment castings and other types made of Armco 17-4 PH Stainless Steel.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

It's a Date: Chicago in September

The greatest show on earth is but a short time away. It will be playing in Chicago September 6 to 17. And you won't want to miss it.

It will offer the greatest aggregation of production equipment ever assembled in one place. Almost all of it will be new this year, and much of it has never before been on display anywhere.

It will really be something! Its purpose, unlike that of Ringling Brothers-Barnum & Bailey, is not to entertain. Its chief aim is to show you how you can get more production out of your shop at less cost. And a better product too!

Today, more than $1 billion a year is being wasted in machining costs. That is because the nation's metalworking plants, in large part, are machining products by old-fashioned methods on obsolete machines.

The Chicago Show has a prime objective — to eliminate that waste.

Your cost problems are greater than ever, unless you have been mighty lucky. Looming in your mind must be that guaranteed annual wage that the unions are fighting for. And higher hourly rates. And a heap of fringe benefits that cost money.

Then, in an effort to beat competition, you dangle before your customers the inducement of a bigger and better product. You have to contend with the cut-rater. Just calling him a stinker may make you feel a little better, but in itself it does not bring you any business. You've got to fight him with a superior product properly priced.

All of this adds up to an interesting conclusion: **You cannot afford, without inviting disaster, to let your product or your shop become obsolete in this highly competitive era.**

You cannot sell a 1955 product at 1955 competitive prices if it is being made on machines of pre-World War II or even on those of 1945-1947 design.

Even if you are up-to-date in your production equipment, you won't stay that way long if you sit back and say, "I know the answers. They can't show me anything. This new stuff is for the other fellow."

How much do you really know about today's newly - designed machines: self - resetting lathes, tape-controlled machines, highly-automated production units, standard machines that yield savings as great as 60% compared with yesterday's machines?

Chicago in September is the place and the time to find out. Hundreds and hundreds of new machine tools of 1955 design will be on display for almost two weeks. Machine tool builders are spending millions to present this greatest show on earth.

No other industrial exposition comes remotely near it in size or in numbers of visitors. It will take more than two months to assemble it.

The Big Tent will be pitched at the International Amphitheatre and in an adjoining building erected especially for this occasion. One sideshow will be operating at the Navy Pier — the Production Engineering Show. And another will be running at the Coliseum.

This is the first time since 1947, eight years ago, that the Big Show is playing. You can't afford to stay away from it. Better make your Chicago hotel reservations now. And you'd better plan on staying at least three or four days.

Burnham Finney

the UNUSUAL is NORMAL for CINCINNATI SHAPERS

Stress relieving this massive gear required unusual rigidity of table and cross slide, and accurate starting and stopping of the shaper.

Photos courtesy Couer d'Alene Hardware & Foundry Company, Wallace, Idaho.

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- 50 P.S.I. automatic lubrication.
- Full control of all machine functions at operator's position.
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THE CINCINNATI SHAPER CO.

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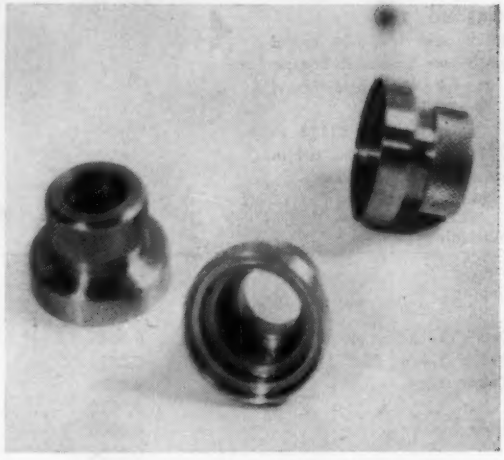
American Machinist

PART NO. 1
Stock Size: 15/16-in. round
Machined: Brown & Sharpe No. 2 Automatic Screw Machine
Changing from B1113 to C1119 resulted in an increase in surface speed of from 250 to 317 sfpm with the same feed.

Machining	Feed per rev.	B1113 sfpm	C1119 sfpm
Turn	0.0074	250	317
Center	0.003	230	292
Drill 13/16-in. dia	0.0027	227	288
Drill 0.680-in. dia	0.0039	190	242
Form	0.00038	246	313
Drill 17/32-in. dia	0.0046	149	190
Drill 0.326-in. dia	0.005	108	137
Knurl	0.0011	173	220
Ream	0.006	229	292
	0.002		
Ream	0.0025	152	193
	0.003		
Cut Off	0.0013	250	317
Seconds to make one piece		50	45
Production per hour		72	80



What is the best screw-machine stock?

Extensive production tests indicate that machinability of C1119 steel is better than the conventional ratings given it in handbooks. Here is evidence that a general revision of thinking about screw stocks may be in order

RICHARD F HARVEY, chief metallurgist, BROWN & SHARPE MFG CO, PROVIDENCE

Machinability is a complex, elusive quality. In its generally accepted meaning the term denotes the ease with which material is machined and it may be evaluated in several different ways:

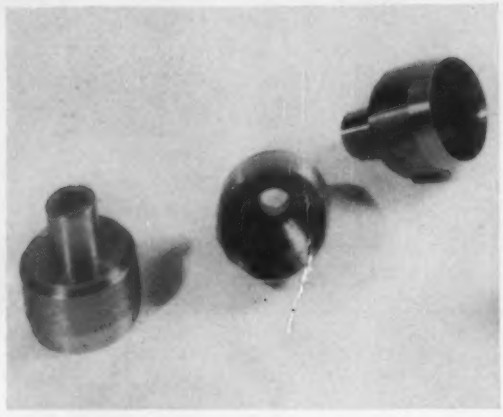
(1) speed at which the material may be cut
(2) tool life
(3) energy or power required
(4) surface finish produced
(5) dimensional accuracy maintained
(6) chip characteristics

Objectives are not always the same and machinability ratings as determined by one criterion may differ from those obtained with another objective in view. For example, finish and dimensional accuracy in the as-machined condition are often of prime importance on intricate parts made on screw machines. On the other hand, parts may be finish ground after machining in which case the finish and accuracy on machining may be a secondary consideration.

In evaluating various materials cut on screw machines, tool-life tests on a standardized operation such as turning have been used, but the most satisfactory test is on actual production parts where all varieties of machining operations are encountered, including turning, forming, drilling, tapping, knurling, boring, reaming, cutting off, etc. The fast production rates and high surface speeds characteristic of automatic screw machines permit rapid and accurate evaluation of the machining characteristics of the various steels.

C1119 steel, having higher carbon and manganese than standard B1113 screw stock, has been used to a rather limited extent since it was first made for spark-plug manufacture about 25 years ago. This grade found acceptance by spark-plug manufacturers because it is more satisfactory for crimping than standard Bessemer screw stock. In recent years the Bessemer grade B1113 and the corresponding open-hearth grade C1213 have become recognized as standard free-machining grades.

C1119 is rated low in the standard machinability classifications and apparently its excellent machining characteristics have not been utilized. The 1952 Manual on Cutting Metals published by the Ameri-



PART NO. 2
Stock size: 15/16-in. round
Machined: Brown & Sharpe No. 2 Automatic Screw Machine
Changing from B1113 to C1119 resulted in a cut in machining time of 25%.

Machining	Feed per rev.	B1113 sfpm	C1119 sfpm
Turn	0.0076	220	290
Center	0.0026	195	258
	0.0013		
Drill 13/16-in. dia	0.004	190	250
Drill 0.234-in. dia	0.0036	55	73
Counterbore	0.0076	194	256
	0.0019		
Form	0.0006	213	280
	0.0004		
Ream	0.0065	57	75
	0.0021		
Recess	0.007	59	78
Finish Cut Off	0.012	220	290
Seconds to make one piece		120	90
Production per hour		300	400

can Society for Mechanical Engineers lists C1119 with a machinability rating of 117% as compared with a rating of 143% for B1113. The American Iron & Steel Institute, in Steel Products Manual, Section No. 9, lists C1119 with a machinability rating of 100% as compared with 136% for B1113 and C1213.

In recent years there has been a trend toward lower carbon screw stock and superior machining qualities are claimed for grades having a maximum of 0.08% carbon. Our own experience indicates that such low-carbon material tends to be "gummy" and is not as free machining as the higher-carbon grades.

Preliminary single-point turning tests carried out on lathes and automatic screw machines showed good machining characteristics for C1117 steel as compared with B1113 and C1213 screw stock. The C1117 steel was actually faster cutting than the high sulfur screw stock as determined by tool-life tests on turning. These preliminary tests were limited to turning operations only and machinability on other operations was not evaluated. Since these results are contrary to published information, confirmation was obtained by independent tests conducted by two manufacturers of screw stock. Brief mention is made of this preliminary work because of the fundamental considerations involved and because it pointed to the fine machining characteristics of C1119 steel. The standard composition limits for AISI C1119 steel, non-killed, are listed in the Table.

C1119 has the same sulfur range as B1113 or C1213 steel and is priced the same.

Tests conducted on C1119 steel over a period of nearly a year show the following results:

(a) C1119 is consistently a better-machining steel than B1113 or C1213 as determined on actual production parts machined on automatic screw machines.

(b) C1119 is not as readily machinable as leaded screw stock in small diameters. However, there is evidence, which cannot yet be considered conclusive, that leaded screw stock in larger diameters over about 1½ in. in diameter is subject to lead segregation and the machinability of this grade, particularly on drilling, is not as good as it is on small diameters.

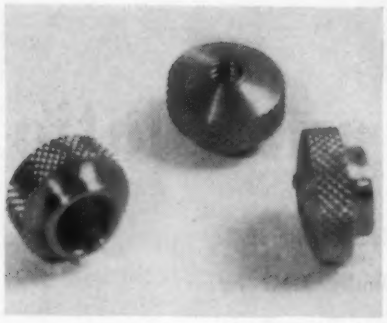
(c) C1119 has higher hardenability and is a better case-hardening steel than standard grades of screw stock, leaded or non-leaded. C1119 steel with higher manganese shows up particularly well on hot-quenching applications where sections up to about ¾ in. may be fully hardened in an agitated hot-salt quench. B1113 and C1213 do not case harden uniformly and the low hardness of the core is often unsatisfactory. C1119 is much improved in these respects.

Many tests have been conducted on automatic screw machines comparing the machinability of C1119 with standard non-leaded grades B1113 and C1213 as well as with leaded screw stock. Several examples of results obtained with C1119 steel taken from our files are illustrated together with the tabulated results. The superiority of C1119 over non-leaded screw stock has been confirmed in the laboratories of one steel producer as well as by an outside screw-machine operating plant.

In order to obtain satisfactory machining characteristics with C1119 steel, careful attention to specifications and manufacturing practice is necessary. The steel should be non-killed with 0.10% maximum silicon and, in fact, the lower the silicon content the better the machinability. Also the sulfides should be globular rather than long and stringy.

This information is presented with the thought that it will be helpful to users of free-machining steels. It is not intended as a general recommendation for any particular grade of steel. Ultimate selection of the steel for any particular application should be based on several considerations depending on the operations involved and the objectives in view.

It is felt that the good machining characteristics of C1119 can be further improved, perhaps by about 25%, by the addition of lead. The results of recent investigations present strong indications that



PART NO. 3
Stock Size: ⅝-in. round
Machined: Browne & Sharpe No. 2 Automatic Screw Machine

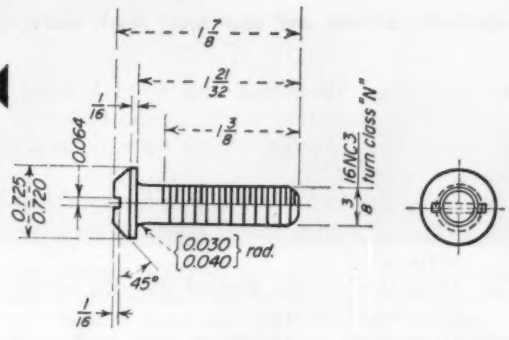
Changing from B1113 to C1119 resulted in an increase in surface speed of from 204 to 259 sfpm with the same feeds, to result in an increased production rate of 20%.

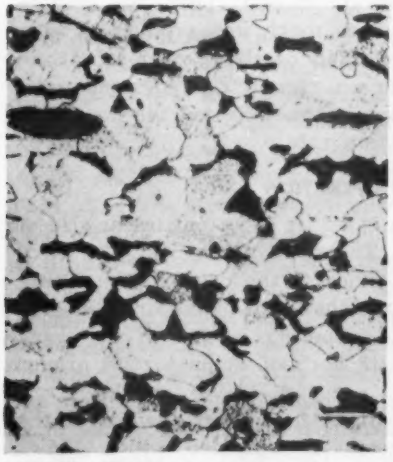
Machining	B1113	C1119	Leaded C1213
Spindle speed, rpm	1250	1580	1580
Surface speed, sfpm	204	259	259
Seconds to make one piece	20	16	16
Surface finish	Good	Good	Excellent

PART NO. 4, CATCH-ADJUSTING SCREW
Stock Size: ¾-in. round
Machined: Brown & Sharpe No. 2 Automatic Screw Machine

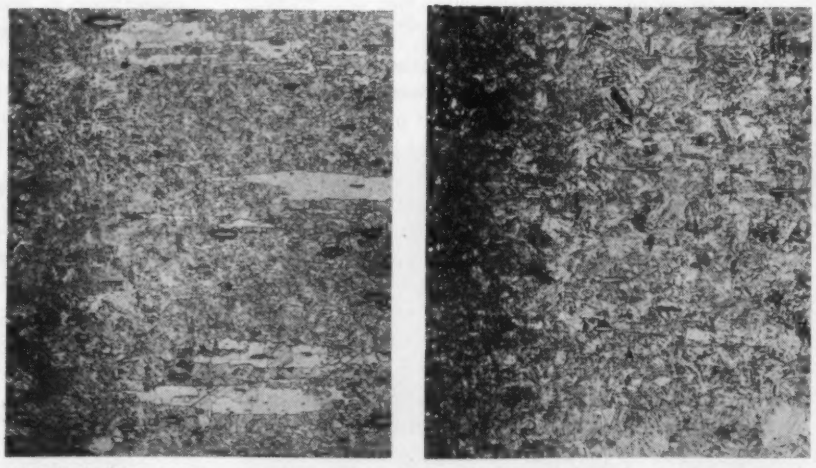
Changing from B1113 to C1119 resulted in an increase in surface speed of from 260 to 310 sfpm and an increase in production of 23%.

	B1113	C1119
Spindle speed—forward, rpm	1310	1560
Spindle speed—reverse, rpm	320	385
Surface speed, sfpm	260	310
Production per hour	65	80





STRUCTURE DESIRED in C1119 is shown at 200X. Heat analysis of this 15/16-in. round was 0.17 C, 1.28 Mn, 0.009 P, 0.27 S. View is nital etch of longitudinal structure



CASE-HARDENED B1113 and C1119 steels carburized in salt at 1600F for 2 hr, quenched in brine. Longitudinal sections at 50X show 0.020-in. case depth. B1113 (left) shows phosphorus-rich ferrite bands extending partly into the case. C1119 (right) shows a uniform case and core structure with no banding or dendritic pattern

leaded C1119 may well be the fastest machining screw stock developed. In addition, its improved hardening characteristics as compared with B1113, C1213 or leaded C1213 should be of importance on many hardened parts machined on screw machines.

Plans have been formulated to test leaded C1119 with phosphorus and nitrogen on the high side and it is planned to make the results available when sufficient experience and data are obtained.

STANDARD ANALYSIS OF FREE-MACHINING STEELS

	B1113 C1213	C1117	C1119	Leaded C1213	Proposed Leaded C1119
Carbon	.13 max	.14/.20	.14/.20	.08/.15	.14/.20
Manganese	.70/1.00	1.00/1.30	1.00/1.30	.75/1.25	1.00/1.30
Phosphorus	.07/.12	.04 max	.04 max	.04/.09	.07/.12
Sulfur	.24/.33	.08/.13	.24/.33	.20/.34	.24/.33
Silicon	.10 max	.10 max	.10 max	.10 max	.10 max
Lead	—	—	—	.15/.35	.15/.35
Nitrogen	—	—	—	—	.010/.025

Manual loading with minimum idle time...

Tooling boosts automatic

With the trend to automatic operation, the development of special machines includes some additional considerations. Loading time is a major influence on productivity. Flexibility must be weighed in terms of demand and cost. Downtime for setup, or maintenance, becames increasingly important. Builder and user must work more closely than ever before. Here is an example

Our problem: To design and build a machine, or machines, to complete three different sizes of electric-motor-fan casings. These operations were required:

(1) Drill four holes in the end, for mounting bolts.
(2) Drill one large hole at center of end for nameplate plug.
(3) Drill three holes around the rim as clearance for grease fittings.
(4) Bore large diameter at open end to fit with body housing.

The production requirement for this job was 25 finished pc per hr.

This was just one of the simpler production problems that resulted when a large manufacturer of electric motors set up a new plant to produce a new line of motors. However, it illustrates tool design for manual operation that must coordinate with automated tools. This was only one of a number of special-machine problems given to us.

Conferences were held between representatives of the manufacturer and our engineers. Various methods of approaching the problem were discussed. A transfer machine approach: too clumsy and inflexible for the production requirement. Single-purpose machine with fully automatic loading and unloading: too expensive, not readily modified for design changes in part, insufficient production demand, danger of downtime bottle-necking production flow. Finally, it was agreed that for the most practical operation, two manually loaded machines were required. One machine is designed to complete all of the drilling operations, while the other machine completes the bore. Both machines can be operated by one person; are placed in adjacent positions on the line.

The first machine consisted of a base in which was mounted an air chuck with special jaws, and fixtures, for locating and holding the three different sizes of work. On this base were also mounted three horizontal drill units for drilling the three holes around the periphery. Attached to the base was a column which contained a multiple-spindle drill-head, for drilling the four mounting-bolt holes, and the one center hole for the nameplate emblem. The four drills for mounting holes are universally movable and easy to reposition; hence require a minimum of time to change from one size of work to another.

For this operation, a gage plate was designed for each size of work and the changeover consisted of aligning the drill spindles with the gage plate. This setup could be accomplished in about thirty minutes by one man. However, before completion of the machine the production schedule was increased and we were asked to alter the machine, as far as possible, to accomplish the revised rate of production. Because the cutting operation was already operating at the most efficient speed, we studied ways of eliminating as much *non-productive time* as possible. The method of changeover from one work size to another was completely redesigned, and the resulting savings in time effected the necessary increase in production rate.

DRILLING MACHINE OPERATION

(1) The machine is set up for a particular size of work to be drilled. This consists of setting the work clamps on the air chuck to the proper size, setting the proper drill bushings in all of the drill bushing plates, inserting the proper size of drill in each spindle, setting the four vertical drills to the proper spacing.

(2) The piece is placed open end down over the air chuck and a treadle is depressed, which clamps the work in place.

(3) The button is pushed and the machine cycle starts.

(4) The side drills rapid feed up to the work and then shift to proper feed rate to complete the drilling; then rapid return to start position. The vertical drills rapid advance up to the work, change to the proper rate of feed to drill the four bolt holes and size the center cored hole. When both the vertical and the horizontal heads have completed their cycle and returned to start position, the cycle is ended, and the machine stops. The work is unclamped, manually removed, and a new piece is inserted. Pressing the button repeats the cycle. If, for any reason, the horizontal drills have completed their operation, and have returned to start position, but the vertical drills have not yet completed their operation, the machine continues to operate until both heads have returned to start position.

drill output

WILLIAM KRAFT, chief designer,
THE SIMMONS MACHINE TOOL CORP, ALBANY, NY

For the fourth operation a machine, similar to the drill, but arranged for boring, was designed. This machine, performing as it does only one operation, was somewhat simpler. However, the work is bored in an inverted position. With the walls as thin as they were, no pressure could be placed on them without distorting the work and producing an out-of-round bore.

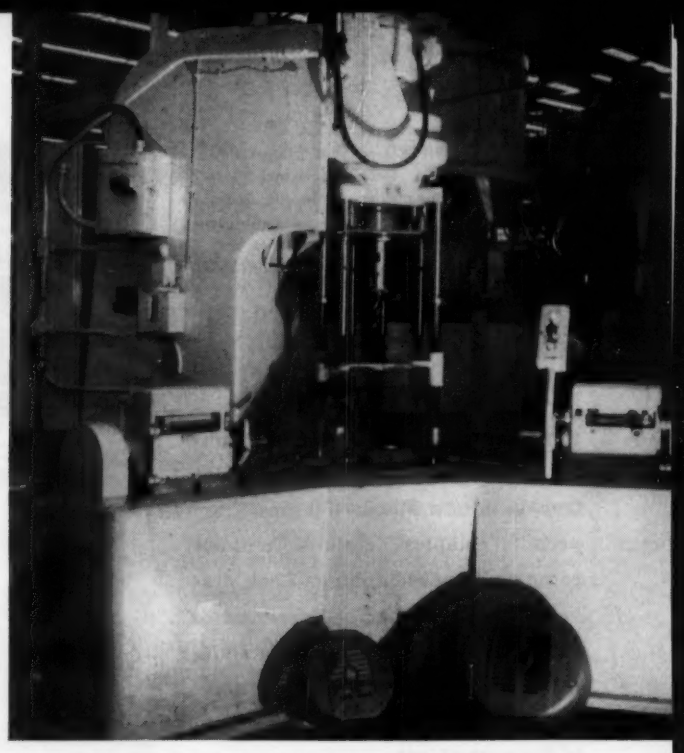
Several methods of clamping were tried before a satisfactory method was found. The extremely thin wall of the piece was the most serious problem. Also, because this thin wall led to many of the castings being out of round in the cast state, boring of the round hole was even more difficult.

Working with the customer, the design of the casting was altered enough to keep this distortion to a minimum. Raised pads were incorporated on the inner wall so that the boring operation consisted only of cutting a counterbore into these raised pads. The work was clamped through the center hole by pulling the casting down on three pins which were automatically inserted into the three holes about the periphery, which had been previously drilled on the drilling machine, thus no pressure was exerted against the side wall. After the changes in the casting were made the boring operation was easily accomplished within the required tolerance. The boring cutter utilized inserted carbide; contained 16 cutting teeth. The cycle of operation on the boring machine is:

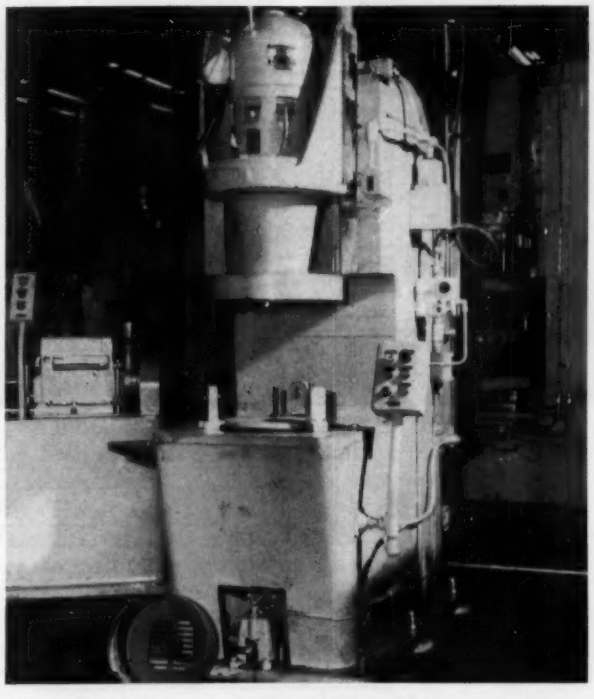
(1) The machine is set up for the particular size to be run. This consists of setting the side clamps and mounting the proper boring tool.

(2) The work is placed, open end up, over the air chuck and a treadle actuates the air clamping method described above.

(3) The start button is pushed to start the cycle of rapid approach of the boring head, to within 1/32 in. of the work. Then the feed cycle takes over and feeds the cutter to a predetermined depth, at which point the machine dwells and the cutter rapidly returns to the start position. Finally, the spindle stops rotating. As the boring head approaches the work, an apron surrounding the cutter descends to protect the worker from the cutter. This apron drops over the outside of the work and also prevents any chips from flying out of the work area.

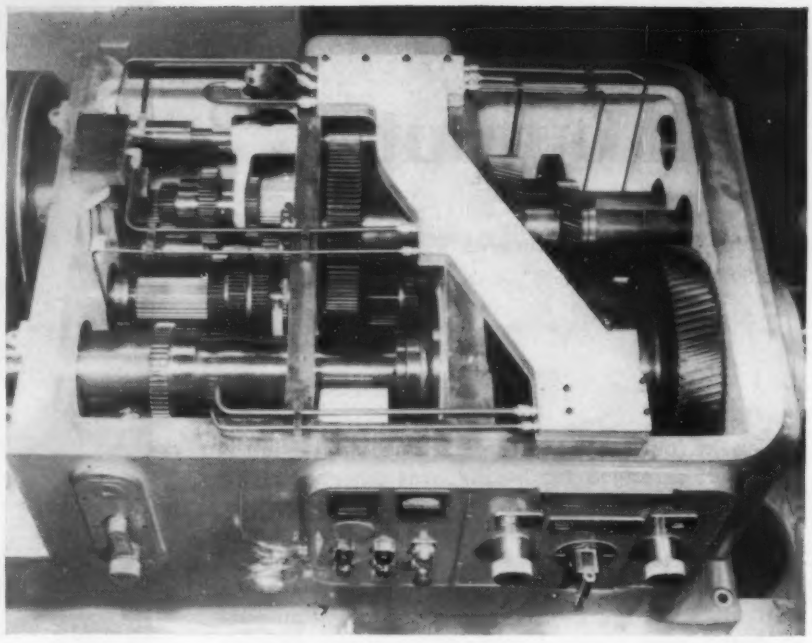


AUTOMATIC DRILLING MACHINE is designed for manual loading and unloading with minimum non-cutting time. Electric-motor-fan covers are placed in nest-fixture open-end down. Stepping on treadle actuates air clamps to firmly grip piece. When starting button is pressed all eight drills rapid advance to within 1/32 in. of work, then shift to proper sfpm for drilling; are rapidly retracted when drilling is complete. Spring-loaded pressure pad above work contains drill bushings and advances ahead of drills to support work until and while drilling takes place. Side drills are driven and fed through mechanical, self-actuated heads



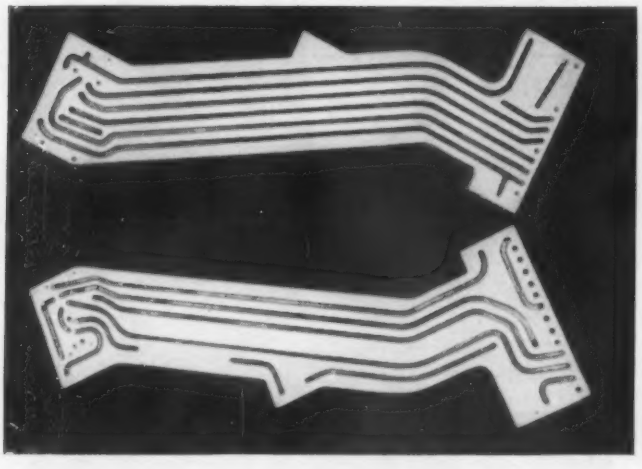
BORING MACHINE is located adjacent to drilling machine; cuts with 16-tooth, inserted-carbide milling cutter, driven directly from motorized head. Work is held in nest-fixture, air clamped with open end up by means of treadle. Pressing button starts cycle which rapid advances head to bring cutter within 1/32 in. of work, then slows to proper feed rate. With boring complete, head retracts and machine is automatically shut off

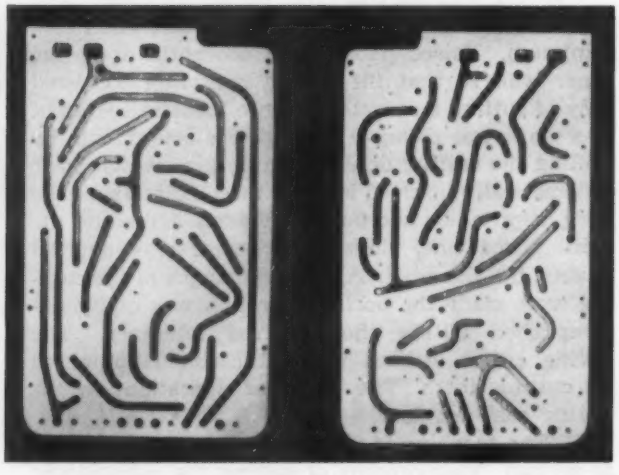
ALUMINUM MANIFOLD reduces fittings and tubing required in lathe headstock — is capable of withstanding hydraulic pressure in excess of 1200 psi. Assembling three plates by brazing provides a strong, airtight joint and eliminates time-consuming mechanical operations.

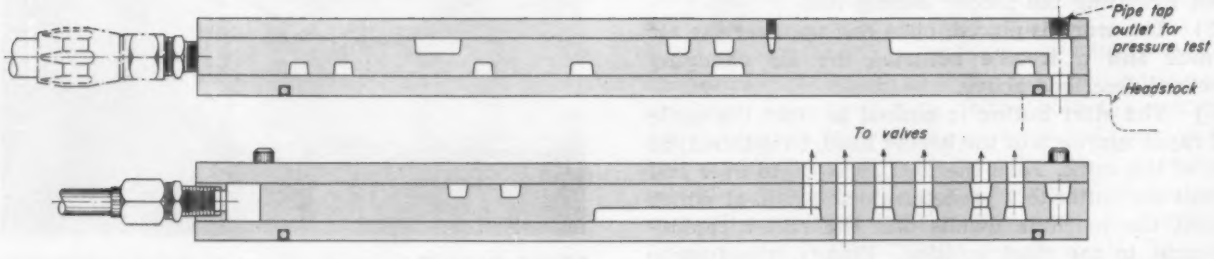


Hydraulic manifolds eliminate tubing, fittings, and potential source of trouble in new Monarch lathes. They permit complex circuits without complex stands of tubing. Leak prevention is the prime requirement in joining "sandwiches" of aluminum plate together to make them, therefore careful brazing techniques had to be worked out

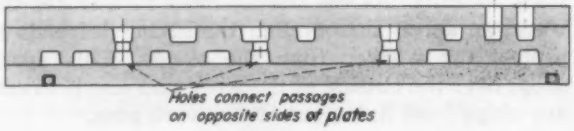
Special techniques braze leakproof

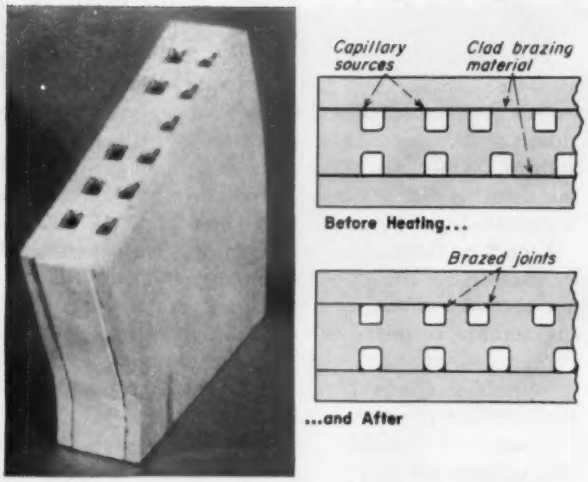






COMPLEX HYDRAULIC CIRCUITS are obtained in a small space by channeling the center plate of a manifold on both sides and connecting the passages with through holes. Outer plates contain holes for mounting, passage of oil to valves and inlet and outlet ports. Inner surfaces of outer plates are clad with low-temperature brazing alloy, center plate is wrought aluminum





MODIFIED "FLAT-TO-FLAT" BRAZING is achieved by taking advantage of capillary action. "Capillary sources" are like magnets—attract molten brazing material which expels the flux and solidifies. Flux is squeezed out by free flow of braze during the heating cycle, thereby eliminating flux inclusions and producing a strong, air-tight joint

aluminum manifolds

NAGLE V GUSCHING, chief development engineer, and
JOHN OBREBSKI, chief metallurgist
MONARCH MACHINE TOOL CO., SIDNEY, OHIO

Hydraulic manifolds have long been used in machine tools to make complex piping circuits more compact, reduce maintenance, save space, and eliminate great amounts of tubing and fittings. By cutting down the number of pipe threads and tube joints required in a circuit, many potential leakage points are eliminated. Hydraulic efficiency is increased because valves are closer together and flow paths correspondingly shorter. Flow losses are lower because there are fewer expansion and contraction head losses. Less volume in the circuit improves dynamic conditions by reducing the amount of compressible oil, consequently response is better and dynamic circuit characteristics are improved. In addition, flow cross-sectional areas can be of maximum size for a given area devoted to hydraulic conduit, and there are no large strands of tubing subject to vibration and fatigue fractures.

WHY BRAZED ALUMINUM?

Brazed aluminum was selected because of its advantages over other manifolding methods. Other types include cast-iron plates ground to close tolerances and held together by screws, as well as steel manifolds joined with copper alloys by means of a brazing process. Brazed aluminum has advantages over these methods in that machining tolerances are not close and because aluminum is inert to oil. Other methods considered were securing the manifold plates with a thermosetting adhesive, and drilling channels in solid blocks. Experiments indicated that thermosetting adhesive has poor time-strength and temperature-strength curves which prevent channels from being as closely spaced as in aluminum brazing and that drilling would not provide as smooth passages and complex circuits.

Aluminum provides excellent thermal conductivity, good machinability, light weight and corrosion resistance. Monarch's assembly consists of a ¾-in.-thick center plate of aluminum and two ⅜-in.-thick outer plates made of a wrought heat-treatable alloy clad on one side only with a special low-temperature aluminum-brazing alloy.

Channels in the center plate are produced by routing both sides in accordance with a master templet to an appropriate depth. Spacing at the closest points between grooves is held to a minimum to conserve space. Short spacing is possible because of the leak resistance of the joint, consequently units are very compact. Contouring the grooves by routing reduces velocity-head losses by eliminating abrupt changes of direction. Cross holes and entrance holes are jig drilled and, after deburring, the center plates are ready for brazing. Outer plates, of course, have mounting holes and holes for "O" ring mounting of valves machined in. Because of the brazing, grinding plates flat to close tolerances is not necessary.

Leak resistance under pressures in excess of 1200 psi is required in operation, therefore joints must be

MACHINING PASSAGES in manifold center plate is quick and easy with this routing setup where a master plate with previously machined passages is used. Center plate is clamped on top of the master which is placed over a guide pin in the center of the machine table. The pin engages a passage in the master, thus guides the work as it is moved under the tool. After all channels are machined on one side, the master and work are turned over and the process repeated

Aluminum manifolds continued

accomplished without interruptions, flux inclusions, or cavities. Plates must be flat and tight and have leak-resistance as well as good strength and aging characteristics.

Considerable research went into joining parts with an uninterrupted core of braze. Hydrostatic and hydrodynamic action of the liquid brazing material and flux had to be considered. Liquid brazing material and liquid flux are of similar viscosity at brazing temperatures, so it is difficult to eliminate flux from the joint after it has done its work of dissolving oxides. Taking advantage of capillary action and surface tension was found to be the only means by which flat plates could be brazed to form a solid, flux-free joint. Actually, "flat-to-flat" brazing is difficult, and special techniques were necessary to permit free flow of the braze and complete elimination of the flux. In conventional flat-to-flat brazing, there is no way to force the molten flux out of the joint. Adhesion and cohesion tend to keep the molten flux together and the weight of the plates spreads the flux over a relatively large area. This results in comparatively large round flux inclusions with attendant weakness and possible leakage.

Study of three actions, capillary movement, surface tension and free flow of braze, was undertaken and special brazing techniques were developed. These create conditions in which capillary forces of the alloy pull the liquid brazing alloy into the area to be brazed while free flow of the alloy forces out the liquid flux.

Points where the edges of the grooves or channels in the fluxed center plate touch the clad center plate at the start of the operation are called "capillary sources." At the brazing temperature, about 1100 F in this case, the clad material melts and spreads out toward the edges of the grooves where the "capillary source" exists. When the material thus moves, it forces out the flux and solidifies, thereby providing a strong, leakproof joint.

Limitations on the size of flat plates that can be treated in this manner have not been reached, but manifolds as large as 12x36 in. and 15½x20 in. have been successfully brazed. Design requirements include careful consideration of forces acting on the molten braze material and flux, and proper balancing of the vital dimensions influencing the flow of the liquid brazing material and flux.

AIR-PRESSURE INSPECTION

Special testing fixtures have been developed for hydraulic tightness and clear passages through the channels. In the test, a manifold is clamped between two outer plates of a fixture with each of its numerous circuits, made up of several interconnected channels, connected to a special quick connector through which a male connector admits air at 85 psi pressure. Color-coded, self-sealing female quick connectors are engaged in all the other ports of each circuit, and the circuits may have as many as six outlet ports. All ports are sealed to the tubes leading to the quick connectors with "O" rings of the same size and type as used in the valves on a lathe.

Tightness of circuits is first tested by admitting air at 85 psi at the male connector with all female connectors closed. The pressure-supply valve is then closed and maintenance of pressure at a gage on the manifold side of the pressure-supply valve assures the tightness of the multi-channel circuit. This test is repeated on each connector (one for each circuit).

Free flow through specific channels is then checked by connecting the 85-psi air supply to one male connector and connecting a flowmeter in turn to each of the female connectors associated with the circuit. Proper flow at each female connector indicates clearness of the channel, and this test is repeated for each female connector in each circuit.

Monarch's manifolds operate at pressures in excess of 1200 psi and have been checked at hydraulic pressures as high as 2200. In developing this method of assembling, prototype plates were cycled over one million times with pressure varying between 300 and 1600 psi with no evidence of leakage or fatigue breakdown in the joint. Use of air pressure in production testing is quick, simple, and will indicate an extremely high resistance to leak. Air is far more likely to escape than hydraulic oil, thus is a quicker and more-sensitive testing medium.

AIR-TIGHT BRAZED JOINTS and free flow through channels are tested in this special test fixture. Assembled manifold is clamped between two plates while air at 85 psi is introduced to each circuit through a male connector. A male connector is "O"-ring-sealed to each of the circuits at one of the regular ports. Female connectors are "O"-ring-sealed to the remaining ports. Free flow of air is flowmeter checked at the individual color-coded self-sealing female connectors at all ports. Tightness is checked by closing the supply-line valve and observing a pressure gage connected to the circuit for drop in pressure

DIAMOND LAPPING a carbide tool at the Torrance plant of Douglas El Segundo. Diamonds in the lapping compound roll over the surface, producing finishes of 1 mu in.

Startling increases in tool life and cutting speed are reported when . . .

Douglas diamond laps carbide tools

Experiments with diamond lapping of carbide tools were started at the Torrance plant of Douglas Aircraft Co's El Segundo Div with the intention of lapping tools used in Borematics, tracer lathes, and turret lathes.

When early tests showed that diamond-lapped tools produced more parts with better finishes and closer tolerances, the program was extended to all single-point tools.

Originally initiated by Garrett Supply Co, which worked with Douglas engineers on the project and instructed tool grinders in the use of the lapping machine, the operation produces cutting edges with finishes of 1 mu in. rms.

LATHE OPERATIONS

Examples cited include turning a 1½-in. OD on hexagonal 4130 steel. Length of cut was 5⅛ in. at a depth of 0.093 in. Operating at 352 rpm and 0.007-ipr feed, tool life averaged 34 pieces per grind. With the roller-turner tool diamond lapped, it was possible to increase speed to 740 rpm, feed to 0.018 ipr, and deliver 152 pieces per grind.

Landing-gear-wheel cylinders are turned in a tracer lathe from 4-in. OD steel, heat-treated to 180-220,000 psi. A Carboloy D-12 tool set at an 80° incline and ground with a chip breaker took a cut 18 in. long and 0.273 in. deep. Three or four cuts were required to complete one part, with three to five pieces produced per grind.

When the tool was diamond lapped, only one cut was needed to complete the part, and 11 to 16 pieces were produced per grind. At the same time, lathe speed could be increased from 172 to 390 rpm.

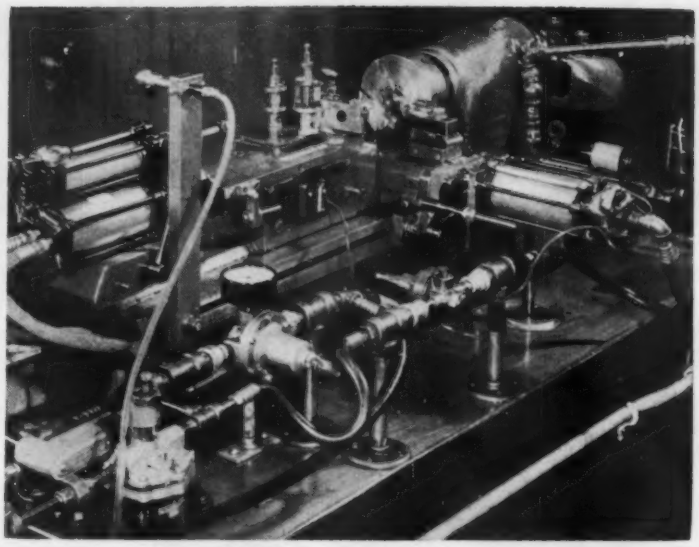
In a boring operation on a turret lathe, 0.040 in. had to be removed from an 8-in. length. Previously the machine was set at 734 rpm and 0.011 ipr. With the diamond-lapped tool, this was increased to 1041 rpm and 0.015 ipr.

ALSO FOR ALUMINUM

An example reported on an aluminum casting is an engine-mount fitting of AA 7075-T. Pieces per grind were 25 to 30 previously, but averaged 206 with diamond-lapped tools. At the same time, speed of the turret lathe was stepped up from 294 to 504 rpm, and feed from 0.008 to 0.011 ipr. In this case, depth of cut was 0.250 and the length was 3.125 in.

Garrett Supply has introduced similar methods in other plants and reports that in one case the tools are successfully making production cuts on alloy steel hardened to 60 R_c.

CLOSE TO ¼ MILLION PC have been bored with this setup. Careful alignment of ram and slide, plus positioning of the boring tool cutting edge in a *vertical* plane, provides accurate tool control and a scrap rate under 1%. Valves and Micro-switches are at rear of machine, out of operator's way. Dial indicator (on turret) is used to precisely position cutting-tool edge



- **Precise boring and facing**
- **No special skill**
- **High production**
- **Minimum capital investment**
- **Improved machine utilization**
- **Fulfilled delivery promises with . . .**

Automatic boring machine built

One of the major problems that sometimes faces a manufacturer of defense products is that of machine-tool availability. Not only are deliveries slow relative to contract requirements, but also a considerable investment may be necessary in equipment which is uncommon to the manufacturer's regular production and may be required for only a single contract. In this situation, necessity often dictates stop-gap methods.

The Ansco Camera Plant received a contract for precision-gear instruments that included boring and facing the small gear blanks to extremely close tolerances. A conventional automatic boring machine was not available for delivery within the required time, and, in addition, this type of machine had very little application in our camera production. It would have to be disposed of after completion of a few defense contracts. Several suggestions were made as to improvised methods. After considering jig borers, precision milling machines, and lathes, we decided to attempt the conversion of a small secondary-operation lathe to a special-purpose, semi-automatic, precision boring machine.

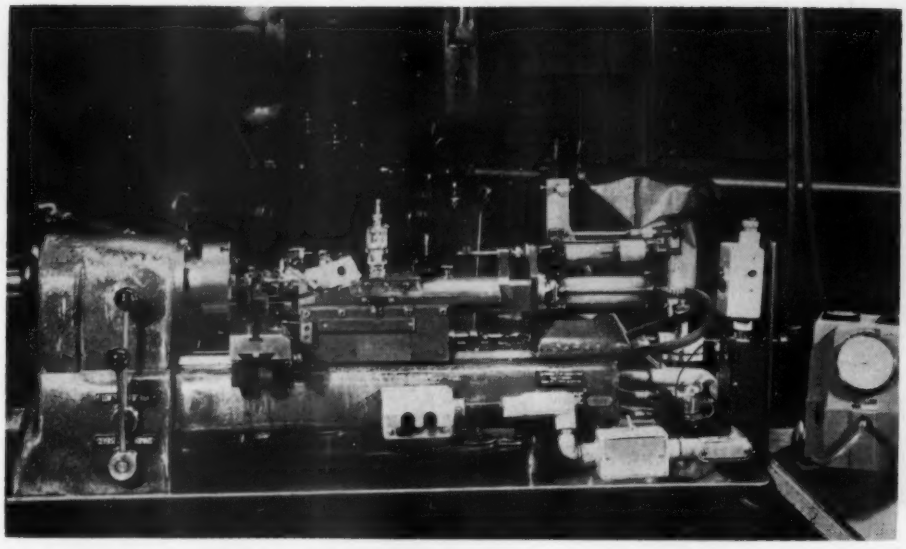
Because power feeds were an obvious requirement, we decided on pneumatic power as the simplest approach. While the use of air cylinders was an old story to us, we were somewhat doubtful about their application in this case—until we learned about the principle of the opposing hydraulic throttling cylinder (Hydrochek) for smoother feeding and better regulation.

To begin the conversion, a ten-year-old lathe was selected and the spindle was reworked to maximum accuracy. The turret was locked and the movement of the ram indicated to determine the parallelism with the spindle axis in both vertical and horizontal planes.

This machine showed excellent results with a negligible error in the vertical plane and 0.0005-in. error in a 2-in. feed in the lateral plane. The ram and saddle were ground and scraped to bring the vertical-plane error to near zero, as this is a solid metal-to-metal contact, with gravity and tool pressure (in our setup) working to insure contact of the bearing surface. Lateral error is controlled by the gibs and is adjusted to maximum accuracy, but the lateral alignment is subject to much greater variation than the vertical alignment.

A most important concept of this conversion is that the alignment of the boring-tool axis in the vertical plane will remain constant and that, by setting the cutting edge of the boring tool in this plane, the taper caused by errors in the lateral-feed plane are minimized because the radial component of the tangential (lateral) error is extremely small. The effect of lateral error in the hole diameter may be expressed as $e = \frac{E^2}{D}$ where e = the increase in hole diameter or taper, E = the lateral error over the depth bored, D = *hole diameter*. (This expression is valid where the value of e is very small compared to D and can be dropped from the denominator in the solution of the triangle.)

Boring tools are special, with inserted-carbide tips only a few thousandths larger than the shank, which is only slightly smaller than the starting hole of the work to be bored. Starting holes are rough bored and reamed to insure that a uniform amount of stock



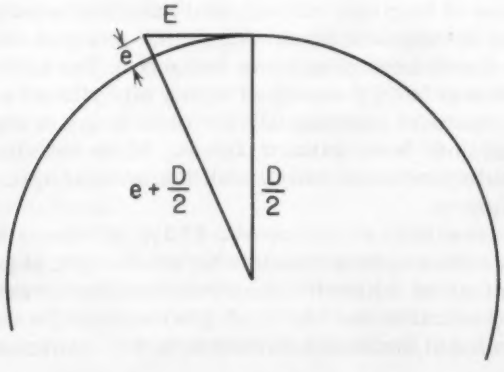
TOLERANCE WITHIN 0.0002 IN. on 0.2500-in.-dia bores produced at better than one per minute is routine on this converted lathe. Ram and cross-slide are fed by air cylinders with hydraulic check valves. Cylinders are aligned directly with feeds to prevent cocking. Operator loads part and pushes button; unloads part when ram retracts and air gages hole at gage head mounted above machine

from benchlathe

ROBERT C SCUDDER, mgr, Manufacturing Engineering
CARL ZICK, methods supervisor
Camera Plant, ANSCO DIV, GENERAL ANILINE & FILM CORP, BINGHAMTON, N Y

is removed in the final precision-boring operation.

The arrangement of the feed systems is interesting, if not spectacular. The air cylinders are operated by pushbutton switches, one for cross-slide feed and one for turret feed. A safety switch is also included to stop the feed in emergencies. The cross-slide works constantly against the Hydrochek when feeding because the travel is short. The ram, however, feeds free of the Hydrochek for "rapid traverse" until a bracket mounted on the ram engages an adjustable stop nut on the plunger of the Hydrochek. Feed rate is controlled by the throttling knob of the Hydrochek, and a scale-and-pointer device is used to facilitate checking the actual rate. Depth of feed is controlled by Micro-switches operating the air reversal valves of the air cylinders for rapid tool withdrawal. Screws mounted on the cross-slide and ram engage the Micro-switches; are adjusted to the desired limit for the ultimate depth of feed.

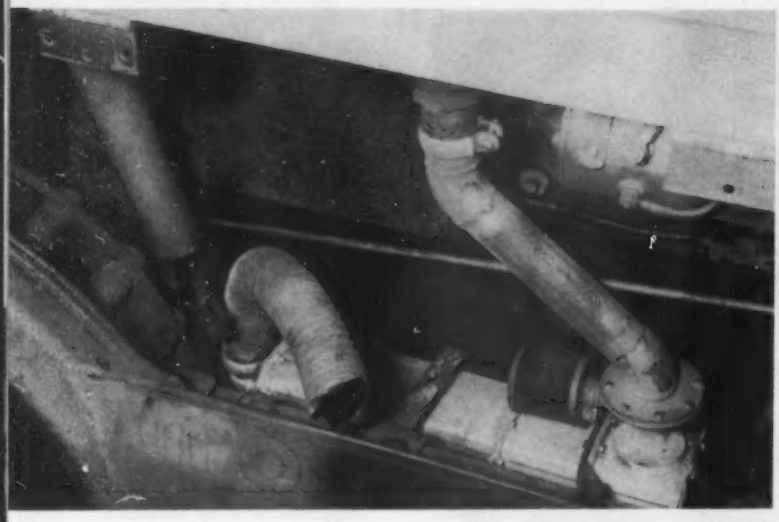


Air-cylinder plungers are connected to the ram and cross-slide through universal joints to avoid the effects of minor misalignments. Because the machine was to be put to hard use, gravity oilers were added to the ram. The boring tool itself is mounted in an adjustable micrometer holder. A "tenth" indicator is mounted directly above the boring tool for use in setting up and adjusting. An air-gage plug is mounted on the rear of the machine so that the operator is able to accurately check each piece during the succeeding cycle. The direct reading of the air gage plus the indicator on the boring tool allow the operator to make quick, measured adjustments.

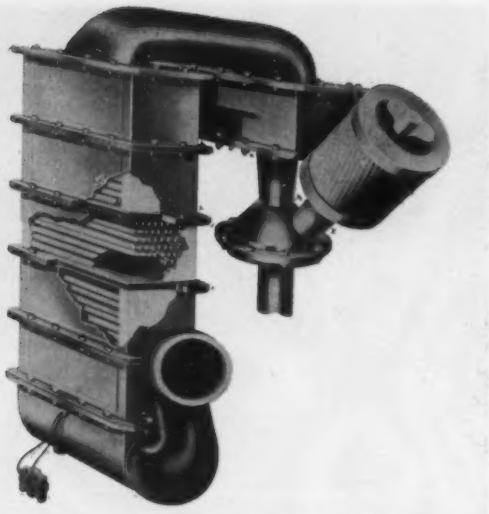
Bored-hole accuracy has been amazing. In aluminum with 0.2500-in.-dia holes, 70% of the bores can be held with + or −0.0001 in. In actual practice holes are bored very slightly on the low side to avoid oversize bores and the percentage which falls below the low limit are sized with a carbide ball in a succeeding operation. In stainless steel, the spring of the boring-tool shank, in small-hole boring, plus variations in stock precludes the same accuracy as for aluminum, but a total tolerance spread of 0.0004 in. can be held on 0.2500-in.-dia holes.

Many thousands of gear blanks have been bored and faced by the converted lathe. Three different headstocks (two rebuilt) have been used with equal success. The machine has been used on a two-shift basis for several months without appreciable downtime.

The total cost of the conversion is under $1000 and at the completion of defense contracts, the 10-yr-old lathe will go back into use in the toolroom or model shop.



CATALYTIC MUFFLER installed on fork truck at Quiet-Heet Mfg Co, Newark, was installed when truck was rebuilt. Truck is used in plant and warehouse



PORCELAIN RODS coated with alumina and platinum alloy oxidize carbon monoxide and hydrocarbons in exhaust to carbon dioxide and water vapor. Exhaust gas draws air through filter to support combustion

Catalytic mufflers move gas trucks indoors

With platinum as a catalyst, carbon monoxide and hydrocarbons can be burned from exhaust in the muffler. Here is a report on how the muffler works and what it can accomplish

Metalworking companies are now using gasoline-powered industrial trucks for materials handling inside their plants and warehouses without danger to employee health from exhaust fumes.

A catalytic exhaust (*AM*—May 11, '53, p 185) which replaces the ordinary truck muffler converts deadly exhaust fumes to harmless water and carbon dioxide at the same time that it removes objectionable odor.

Carbon monoxide in sufficient concentrations can be fatal. Even in lower concentrations, it can produce headaches and nausea, thus lowering morale and slowing down production. Another effect of carbon monoxide—not so widely recognized but of prime concern in plant safety—is that it impairs reasoning power and judgment.

In the past, most units have been installed on trucks after complaints from employees who worked in areas where exhaust fumes accumulated.

American Metal Products, Inc, Los Angeles manufacturer of flue pipe and fittings, bought four gasoline-powered fork trucks. When the trucks worked inside, men complained of smarting eyes and coughing. They suffered nausea and headaches.

The plant engineer took his problem to the fork-truck dealer, who recommended installation of catalytic exhaust. Complaints from nausea, headaches, eye irritation and other symptoms of exhaust poisoning disappeared when the trucks were modified.

In a less typical case, the plant engineer may have a number of gasoline-powered trucks which he uses outdoors and wishes to gradually convert to indoor use. In such cases he may find it expedient to have the catalytic exhaust installed when the trucks are overhauled or the engines rebuilt.

At Monroe Calculating Machine Co, plant mechanics installed the mufflers, bolting them to the engine manifold. Monroe equipped two trucks with the catalytic exhausts. One at the Morris Plains (NJ) plant operates entirely indoors; the other, at the Orange (NJ) plant, is used both indoors and out.

M L Bayard & Co, a Philadelphia contract shop had depended largely on a 20-ton overhead crane for materials handling in its plant No. 2. As the volume of work grew, the crane could not keep up.

A heavy fork-lift truck was selected because it would be able to handle the many different sizes and shapes of forgings, castings, and machined products going through the plant. A gasoline-powered truck was chosen because of lower initial cost. The 4,000-lb truck was factory-equipped with a catalytic exhaust. It is operated continuously for 18 hr a day, with no complaints from exhaust fumes. Most fork-truck manufacturers will now install the units as optional equipment.

In one test, at idle speed, 97.3% of the carbon monoxide was converted into carbon dioxide; at governed speed, where less carbon monoxide is created, the conversion was 92.2%. A good average for units installed in the field is claimed to be 95% conversion.

Clean-up of exhaust hydrocarbon is said to be as efficient, with the original contaminants reaching the atmosphere far below the US Public Health Service tolerance of 100 parts per million for 8-hr exposure and 400 parts per million for 1-hr exposure.

Originally developed by Oxy-Catalyst, Inc, Wayne, Pa, for use with white (unleaded) gas, catalytic exhausts are now available for LPG engines. The recent development of the Dieseler for 4-cycle diesel engines has opened new fields for diesel-powered materials-handling equipment that operates consistently at 60% of rated load or more. In the past, diesel fumes have limited such equipment to outdoor operation.

Four-cycle diesels operating at 60% of rated load develop exhaust temperatures high enough to do a 60 to 85% clean-up job on hydrocarbons and 90% on carbon monoxide. This reduction is enough to eliminate the annoyance factor of the exhaust.

HOW IT WORKS

Heart of the catalytic exhaust is a cartridge containing 71 porcelain rods coated with 0.003 in. of catalytic platinum and alumina alloy. Each cartridge measures roughly 5 by 3 in. The rods are teardrop shaped in cross section to minimize back pressure.

The catalytic reaction which oxidizes the unconsumed carbon monoxide and hydrocarbons takes place at the surface of the rods. The catalyst, by its presence in the muffler, combines the contaminants with oxygen at a lower temperature than ordinarily required to cause the reaction.

Catalytic mufflers are made by encasing the required number of catalytic cartridges inside a steel shell. For gasoline or LPG engines one cartridge is used for about every 35 cu in. of piston displacement. For a diesel engine the number of cartridges needed is determined by a formula based upon the piston displacement and the maximum speed at maximum horsepower.

Catalytic exhausts for fork-lift trucks usually contain three to six cartridges; smaller models for powered floor sweepers contain two or three. Dieselers are somewhat larger—in some cases containing 10, 16, or even more catalytic units.

In addition to catalytic sections, the basic attachment for gasoline and LPG engines contains an air intake assembly at the inlet end of the muffler. This assembly—a venturi nozzle and air filter—sucks in sufficient air to provide oxygen for the combustion of engine contaminants.

White gas is necessary with gasoline engines since lead in automotive fuel will poison the catalyst. To convert to white gas, first change the crankcase oil, drain the gasoline tank of leaded gas, then run the engine on white gasoline for about 50 to 75 hr to get rid of all traces of lead before attaching the catalytic exhaust.

In operation from a cold start, the catalytic muffler usually requires a 3 to 5 min. warmup to reach a condition of optimum clean-up. Standard procedure is to start the engine and run it at ¾ throttle for a few minutes to bring catalyst temperature up to the required 500 F. At this point the catalytic reaction starts and the carbon monoxide and hydrocarbons begin to burn.

Once fully warmed up, the catalyst will retain sufficient heat to continue clean-up even during periodic stop-and-go operations. If operation of the equipment is extremely sporadic, it may be necessary to insulate the catalytic muffler to maintain optimum performance.

Catalytic mufflers for both gasoline and LPG equipment come with a pyrometer indicator—a dashboard device that helps the operator monitor the performance of catalytic muffler and engine. The dial indicator, connected to a thermocouple inside the muffler, gives a reading proportional to the temperature of the muffler reaction.

The dial itself is divided into three quickly read sections—red for "Danger" on the left, green for "Safe" in the center, and yellow for "Caution" on the right.

The dial is calibrated so that when the catalyst and truck engine are functioning efficiently the needle lies in the green zone. Thus, at start-up, the truck operator warms his engine up until the needle reaches the green zone. At any time during the operation, should the muffler cool off, the needle will drop below the green zone. This is a sign to the operator that he should accelerate his engine for a few minutes to bring the muffler to proper clean-up temperature.

At the end of useful catalyst life, when the muffler is no longer removing a major percentage of the engine contaminants, the temperature inside the muffler drops off. At this time the dial needle also drops from the green to the red zone and stays there. This indicates that the catalytic elements should be replaced.

ENGINE EFFICIENCY

The catalytic temperature can be too high—and this is usually a sign of overloading or inefficient engine operation. Thus when the dial needle climbs into the yellow zone the smart fleet operator can save fuel and engine maintenance by getting the machine checked.

Excessive temperature indicates that the catalyst is burning more contaminants than normal. As the muffler burns almost everything, any excess must result from overloading of the engine or operation of the engine on an excessively rich fuel mixture.

When the needle climbs to yellow, therefore, it may be time to check for poor carburetion, worn piston rings, sticky, warped or burred valves or fouled spark plugs.

The catalyst is never actually consumed in the oxidation process. Physical erosion of the catalytic surfaces by particles in the exhaust gases will reduce activity of a significant portion of the catalyst. In practice, catalytic elements are usually replaced after 2000 to 2500 hr of operation.

The catalytic mufflers are designed to have less backpressure than standard mufflers and sometimes increase engine efficiency.

Production control center is the heart of the system. Equipped with two master communicators (tied in with 20 remote call-in stations; an IBM card writing and punching machine); a time-stamping machine; a card storage "tub" file, and an "active job" rack, it concentrates all time tickets and control in one place. Tickets are executed by competent personnel, hence problems created by having operators make out their own time are avoided. Tickets do not become soiled, bent, or mutilated. Status of any job is available within a few minutes

Talk-boxes plus tabulators centralize

DAVID W MYERS, controller, THE PRODUCTO MACHINE CO, BRIDGEPORT 1, CONN

What you gain

1. **Control orders accurately in the shop**
2. **Detailed reports on previous day's output.**
3. **Cumulative and daily targets for machines and men.**
4. **All but emergency expediting eliminated.**
5. **Immediate time requirement for any job, any stage.**
6. **Cut delivery time 50%.**
7. **Reduce inventory; simplify inventory control.**
8. **Perpetual accounting control.**

Our business is manufacturing diesets, diemaker's accessories, and special machine tools. Competition is keen in this field. After we have done everything possible in the direction of quality and price, plus a complete line of equipment, there is only one major selling point left. That value is customer service. This is an extremely important consideration to our customers.

For our own benefit, to hold down costs and avoid waste, as well as to provide faster deliveries and answers to inquiries for our customers, we decided to reorganize our production-control system. Basically, the program consists of using an Executone multi-station inter-office communication system for reporting job time and status, plus the International Business Machines punched-card system for recording, computing, and tabulating the information. Both companies were extremely helpful in organizing the program.

Producto is not a *big* company, by the usual standards. We employ a total of about 300 people in all divisions. Nevertheless, our new production - control system has shown remarkable savings in direct costs as well as many management advantages, some of which were totally unexpected.

Installing our central timekeeping system, including equipment, wire, and all labor, cost just under $3000. Without this system, we would have had to employ five more people for timekeeping. Thus the saving resulting directly from the system is considerable.

Operation of our IBM department costs approximately $2500 per month. At present, using this equipment just for production control, costs, and payroll we have been able to make an over-all reduction of eight employees in our office personnel. Without this system, we would have had to add at least three employees to cope with the additional burden placed upon our accounting and payroll departments by our recent adoption of a plant-wide incentive program.

One other improvement has greatly simplified our planning. We now operate on a 13-period year. With 13 equal 4-week periods (20 working days each), programming is more accurate and comparisons between periods are truer than with the fluctuating monthly system. All production is planned in terms of 20-day units or fractions of a unit. We recommend wider adoption of this system.

REPORTING STATIONS

The Executone system, for the communication part of the operation, was fairly easy to install. It consists of three master stations and 20 individual reporting stations. Two of the master stations are in the production-control office and the third is in the foundry, which is somewhat remote from the machine shop. The 20 reporting stations are placed at key centers throughout the shop and foundry, more or less equidistant from each other. However, the distance is considered less important than the use-load and convenience. For instance, one unit is located in the maintenance department to simplify reporting this activity. Normally, the foundry master station handles only foundry activity, be-

TABULATING DEPARTMENT organizes information on a daily basis, or more frequently if required. Modern electronic tabulating equipment sorts, collates, duplicates, computes, and prints a wide variety of information from the initial marked cards. Report showing performance and efficiency of each operator for the previous day is on each foreman's desk by 11 AM. And this is only one of many tasks that include payroll and inventory

production control

MACHINE RESERVOIR FILE saves time by providing pre-punched cards, with as much information as is available, for each operation or machine. For specific order, it is only necessary to fill in pertinent information

cause of the distinct difference in work between foundry and shop. However, all of the masters are interconnected for emergency use or to permit one control clerk to handle all reporting for overtime or a light second or third shift. Thus, each of the master stations is set up to act independently.

Planning sends an envelope to the shop that contains the operation sheet, blueprint, and work order for each job to be done. At the same time they send a set of tabulating cards for the job to Production Control. There is one card for each operation to be performed on the job and as much information as possible is pre-punched and interpreted on each card: This information covers description of item or part number, operation number and description, number of pieces, unit run time, setup time, total input time necessary to produce all of the pieces of that size, and the order or lot number. The control clerk places these cards in a storage "tub file."

When one of the men in the shop or the foundry is ready to start a new job, he picks the envelope from a rack and goes to the nearest call-in point. There, he presses a button on the communicator which lights a signal on the master. If the control clerk is clear, he immediately acknowledges the call. If he is busy with another call, the other master station can accept or he will signal the mechanic to stand by. Delays seldom exceed 30 sec.

Upon being acknowledged, the mechanic gives his clock number, the name and number of the machine he is operating, the order number, part number, and the operation number and name. The control clerk pulls the proper card from the tub file, marks it with the operator's clock number, stamps it in the time clock, and places the card in the "active" file adjacent to the master reporting unit.

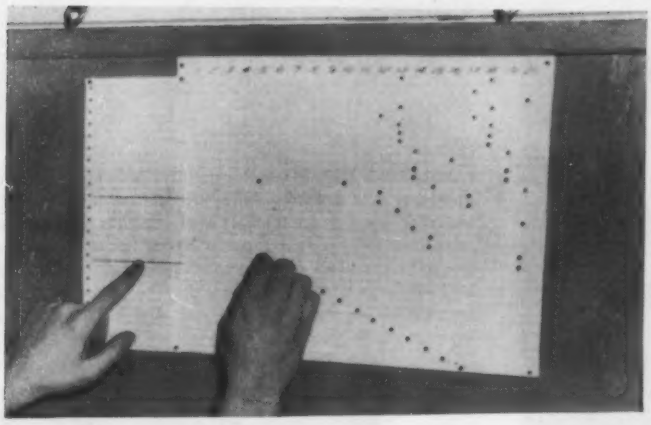
CLOCKING IN AND OUT

When the man calls in to report starting the next job, he also reports completion of the previous job. The latter card is taken from the active file and clock stamped; then sent to Tabulating. If the job is stopped before completion, a duplicate card is prepared mechanically at the control station and placed in the tub file and the original card is sent to the tabulating department.

Because we handle two kinds of work—catalog items ordered for stock and special items on shop orders—two "active" racks are used, to separate and simplify the recording task. One rack is used for catalog items, and cards are filed by machine number. The other rack is used for general machine shop work, and cards are filed by the operator's number. Machine loading is based on the 20-working-day order basis. Production Control processes more than 800 cards during each two-shift day.

In addition to the productive labor cards issued by Planning, Tabulating prepares a supply of prepunched cards for every indirect labor account, which are kept in a special section of the tub file. When, for instance, a maintenance man starts a new job, he calls in the account number and gives his number. The card is pulled, marked with his number, and time stamped. At the end of each day we have a breakdown of indirect labor expense plus the total cost.

To simplify the control clerk's initial recording job, we use an IBM mark-sensitive card. This might best be remembered as the system used to mark and evaluate electronically the multiple-choice tests used by the military. All the



SCHEDULING of tabulating department tasks assures that reports will be ready on time. Simple chart lists 20 work days (one period) across the top and the reports to be prepared along the left side. Thumb tacks are used as markers and each employee in tabulating is assigned a different color. Tack indicates when report is required and who is responsible

clerk needs to do is make a short line with a soft graphite pencil through each of the appropriate numbers on each card. The average reporting-recording time is less than one minute per report.

In Tabulating, IBM mark sensing equipment interprets the pencil marks on the cards into corresponding punched holes. Initially, after punching, the cards are machine sorted into four categories: catalog work, special diesets, special machines, and indirect labor.

DAILY REPORTS

The first record obtained from the completed cards is a Daily Production Report. This report covers the production of each employee in details, is itemized by employee number and includes: order number, part number, operation name, employee's name, no. of pieces completed std hr/pc, earned hr, actual hr, and % efficiency. It also shows whether the job was started on a previous ticket, the incentive number, and the employees' attendance. The latter shows, among other things, the trend of absenteeism.

The entire report is automatically typed from the cards fed into the machine. A copy of the report, covering the previous day's production, is delivered to Management, including each foreman, *by 11 am each day*. Daily timekeeping and payroll records also are prepared at this stage.

In addition to the Daily Production Report, a Daily Production Recap is prepared, itemized by operation. This report shows: today's actual production, today's target, difference, today's downtime, cumulative target, cumulative production, cumulative difference, and cumulative downtime. Thus, using the "management by exception" principle, it is possible to watch production closely, be aware of trends before they become dangerous, and concentrate attention where it is most necessary. It also provides a guide for timestudy and planning personnel.

Upon completion of these reports, the cards are automatically re-sorted into three groups. One group includes catalog diesets and accessories. These cards are used to provide production schedule and target reports; are a major influence in reducing our inventory load while simultaneously improving our delivery time. We now can ship 66% of our catalog orders the same day they are received and the remainder within one day of receipt.

Out-of-stock orders are filled within three days.

The second group of cards includes special-order diesets and special machines. From this group a Machine Division Progress Report is prepared, itemized by order number, to show: part number, operation, operation number (sequence), plus a detailed breakdown of estimated load, progress. and remaining load.

Indirect labor comprises the remaining cards. These are filed, then used to compile a Monthly Labor Distribution Report. Also, they are useful for studying specific problems and costs.

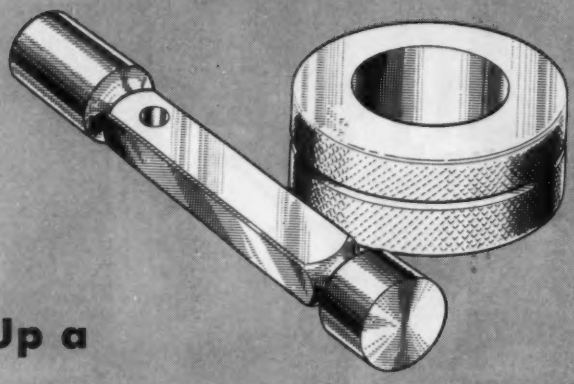
Many different kinds of information are available from the basic cards, either by using them directly or by retabulating information from them into other cards or forms. All cards are collated weekly into a file that will provide a complete history on any job, machine, employee, operation, day, hour, cost, etc, at any time that it is needed. From each employee's weekly cards, a pay card is prepared that includes all hours (straight, overtime, bonus, etc) extended by rate to show earnings. From this card and a standard card for each employee that contains deductions, the machine prints each paycheck and gives the employee a complete record of his earnings and deductions.

The tabulating department maintains a file of work in process and reduces the file by work completed each day. Hence, complete information on work to be done is always available. The system gives day-to-day control and immediate information on status and costs if required. For the first time, the *exact* cost of each piece is obtainable, by merely summing the cost of each operation.

To save time, as much as possible of card preparation is done in advance. For example, a machine reservoir file of basic cards is maintained. These cards contain as much information as is known and simplify the preparation of specific cards. With this card as a master any number of duplicate cards are readily prepared. This file includes one card for every operation that every piece of every catalog dieset must go through—a total of 35,000 cards in four drawers. Any job can be organized, initiated, or accurately estimated within a short time

American Machinist

SPECIAL REPORT NUMBER 396



How to Set Up a

Plug and Ring Gage Policy

D G MECKLEY III, manager, and F W DE HUFF, supervisor
Quality Control and Inspection, YORK CORPORATION, YORK, PA

Fixed-limit gages are and always will be essential for many inspection operations in the shop. But just where does the use of plug and ring gages fit into the over-all gaging policy? What are the vexatious problems connected with their proper selection for a given set of shop conditions and objectives?

When we made a thorough study of gage-making practices, we found that gagemakers take their tolerances in at least three ways. Evaluation of these practices and setting them against our needs, convinced us that the unilateral practice has certain values. This conclusion was reached after each policy was charted and discussed with all departments affected.

You may not want to follow our practices, but at least the information we uncovered may serve as a guide when setting up a plug and ring gage policy to suit your needs.

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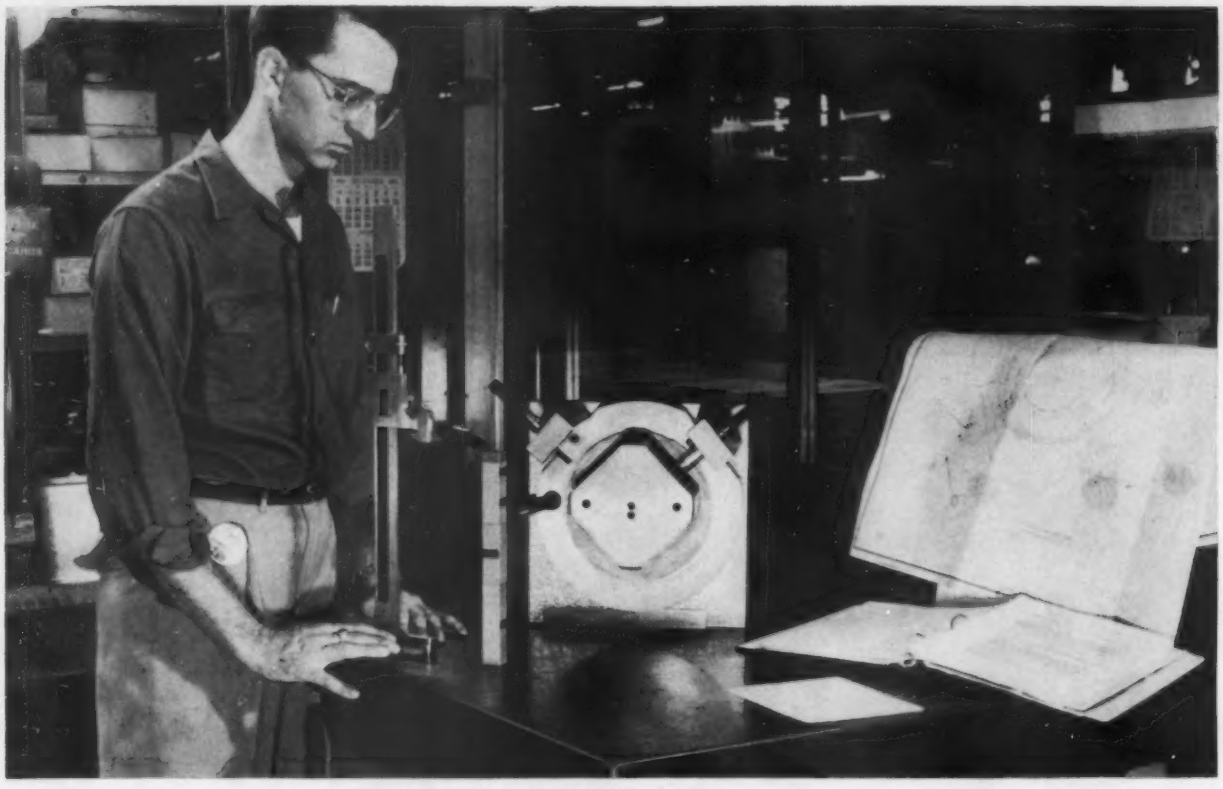


GAGE SUBSTATIONS . . .

. . . are strategically located in York plants to check gages and special tools at predetermined intervals. Here, the gage inspector is checking a production-fixture gage with a height gage and indicator set to a stack of gage blocks. A written inspection sequence must be followed

Base gaging policy on analysis of your problems

Recently the York Corporation adopted a policy for the specification and application of cylindrical plug and ring gages. Many fundamental decisions had to made, such as when to use fixed-limit gages and when to inspect with indicating-type instruments. Two years were required to work out the details of policy, considering the trend of our tolerances, a large stock of fixed-limit gages and the objectives of our quality-control program.

When we completed the study, the results proved worthwhile, but the plug and ring gage policy itself had become only a part of a much broader subject: over-all gaging policy and procedure. (*AM* Special Report 387—Mar 14, '55, p133).

PROBLEMS DUPLICATED ELSEWHERE

The complexities of working out a plug and ring-gage policy make worthwhile a detailed review of the problems we faced and what we did about them, because it is likely that the same problems are widely duplicated elsewhere.

To put a fixed-limit gages in their proper place in a gaging program, all of us must keep abreast of how inspection methods and policy are affected by the modern tempo. We must constantly seek improved production methods to meet or excel competition. In the majority of cases, more complex tools and machines are involved. Product tolerances tend to become more restricted. To keep pace with these changes, the gaging system must be improved in both speed and accuracy.

But does the gaging system always keep pace? Too often obsolete and inadequate measuring and inspecting devices are continued in use, although the job has entered a new category of precision and production rate. The failure to supply adequate gaging equipment and methods can be attributed to two causes: (1) a desire to hold down the initial cost of tooling, and (2) lack of appreciation by engineers and others of the influence of gaging procedures on the production results and costs.

The penalties of an inadequate system then show up when inspection lags behind production. To avoid adding to scrap and rework by gaging errors or omissions, the trend is to adopt gaging equipment that parallels improved production methods, in respect to accuracy, speed and economy. York

and others tend to apply the indicating-type of gage wherever feasible. Here control of production results is obtained by measuring "variables" or increments of change in the tolerance spread as actually produced. Gages of the indicating type supply information for more complete analysis of dimensional characteristics of a piece.

But this trend cannot be carried too far. When a company has a large stock of fixed-limit gages that cannot be economically discarded, the substitution of indicating gages is necessarily slowed down. Besides there are many situations in which fixed-limit gages must be used. One is where the company has government contracts and these call for certain fixed-limit gages. Another case is the checking of parts to tolerances of 0.001 in. and greater. See "Points in General Gaging Policy," as excerpted from *AM* Special Report No. 387.

This gaging policy was not developed overnight. So that you may more readily understand why we adopted a gaging policy, we will relate some of the history of our Gage Control Department.

WHEN GAGES WERE CHECKED

For a number of years the Inspection Department checked gages and instruments whenever a gage failed, or a production problem appeared to be caused by a gage failure. In a few cases repetitive preventive inspection was employed.

In 1948 it was recognized that the shift in inspection philosophy from the idea of finding the mistakes to the concept of error prevention required a similar shift in the ideas held by Gage Control.

The control of gages must be aimed at eliminating the opportunity for error.

At the same time we were teaching foremen and operators the fundamental shop uses of frequency distribution and were making basic capability studies of equipment. These programs helped show a lack of adequate measuring devices and inadequate upkeep of instruments.

We embarked on a survey designed to determine accurately the effectiveness of the program in operation, and to show what was needed to install a complete instrument control program.

In the initial survey, these components were recognized as requisites of an efficient gaging system:

1. An effective gage classification and inventory control system.
2. Periodic inspection and calibration.
3. Standardized calibration methods.
4. Adequate gage laboratory and substations to check gages.
5. Gage design and purchasing standards.
6. Uniform gaging policy for different types of gages, with the fixed-limit gages appearing as the most critical class.

This report is the story of item 6.

The first step was an inventory of all existing facilities. This developed the size of the task. From this we were able to lay out the long-range equipment and location requirements for the gage-control centers.

With the basic equipment needs determined, we started securing control facilities.

We built an air-conditioned gage laboratory wherein both temperature and humidity are con-

Points in General Gaging Policy

1 . . Control by variables is desirable because it provides warning signals before a dangerous position is reached. Control by variables is therefore to be favored over a go-not go system of instrumentation.

2 . . When fixed limit go-not go gages are used, the production drawings will specify the actual hole or dimension required, not the gage size.

3 . . If gage types are specified for a given part or unit application, the gage or instrument symbol is to be placed on the drawing.

4 . . Fixed limit gages are not to be used when the production tolerance is smaller than 0.001 in.

5 . . For cylindrical plug and ring gages, the unilateral gaging system based on Mil-Standards 110-111-112-113 will be used for the tolerance application.

Excerpted from AM *Special Report 387—Mar 14 '55, p141.*

trolled. Later we added several gage substations located at strategic points in the shops. We augmented our stock of equipment by adding gages from the simplest type to elaborate measuring machines. Each step was part of a planned sequence toward the ultimate goal of a complete gage control system.

Concurrently, with the physical equipping of the department we analyzed the primary existing gage policies, and found the following in effect.

GAGEMAKER'S TOLERANCE

Whenever a plug or ring gage is made, the gagemaker allocates a certain amount of the product tolerance for wear allowance and gagemaker's tolerance. *The amount of and direction in which he allocates the wear allowance and gagemaker's tolerance is the source of much controversy.* Today there are three primary methods of applying these tolerances. The three major policies are the bilateral, unilateral and "commercial," which can be explained:

Bilateral gaging policy

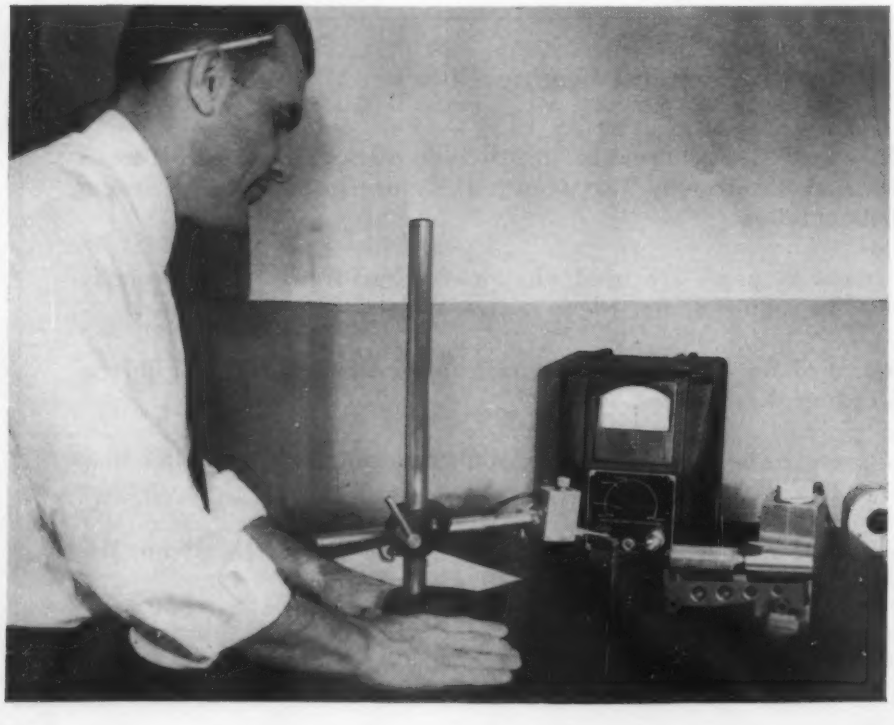
In this policy the gage-tolerance limits may straddle the low and high limits of the product tolernace. Bilateral tolerances are commony used for center distances and hole locations. The gagemaker is given the option of making the gage either inside or outside of the product tolerance. A go or not-go ring can be larger or smaller than the maximum or minimum dimensions of the product.

The chief advantage of this policy is: if the gage is made outside of the product tolerance limits, production will actually have a greater range in which to work. The bad feature is: there is a possibility that pieces will be accepted even though they are outside of the product tolerance limits. Where interchangeability is the major criterion, this possibility must be taken into consideration.

Take, for example, the operation of finish-grinding the bore on a shaft seal collar. The size of the hole is 2.0000 in. The product tolerance is plus 0.002—minus 0.000. The go plug would be the minimum size or 2.0000 in. The not-go plug would be the maximum size or 2.0020 in.

To simplify the discussion we will not consider wear allowances but only the gagemaker's tolerance. If for gagemaker's tolerance, we use the rule of 10% of the total product tolerance, we find that the go plug could be made anywhere between 1.99995 in. and 2.00005 in. The not go plug could be made anywhere between 2.000195 in. and 2.00205 in. If the gagemaker made the go plug to the extreme minimum limit and the not-go plug to the extreme maximum limit, the actual product tolerance limits would be extended by 0.0001 (1.99995-2.00205), thus making an actual product tolerance of 0.0021.

We can readily see that it would be possible for a few of the pieces to be made outside of the product tolerance limits. This condition exists, however, only when the gagemaker takes his tolerance to the extreme minimum and maximum limits. Nevertheless, there is a chance for encroachment or interference between mating pieces, because of the possibility that the gage may have been made outside of the product tolerance limits.



TAPER PLUG GAGE ...
... is checked for wear, using a Brown & Sharpe electronic height gage capable of direct readings to 20 millionths of an inch. Wear since the previous check is recorded and used to estimate the remaining life of the gage

Unilateral gaging policy

In this policy, the wear allowance and the gagemaker's tolerance are always held within the product tolerance limits. That is to say, any gage made to the unilateral gaging policy will never be smaller than the minimum product dimension nor any larger than the maximum product dimension. This policy is used by the Ordnance Departments of the Army, Navy and Air Force. It is well suited to pieces having liberal product tolerances.

In using the unilateral policy for a plug gage, the gagemaker applies his wear allowance and gagemaker's tolerance plus in reference to the go gage. To the not-go gage he applies his gagemaker's tolerance minus. With this practice the go gage may vary in size from the minimum product dimension to some point slightly larger than the minimum product dimension. The not-go gage may vary in size from the maximum product dimension to some point slightly smaller than the maximum product dimension.

ADVANTAGES OF POLICY

The advantage of using the unilaterial gaging policy is that the size of the piece will always be held closer to the center of the product tolerance. The one disadvantage is that the gagemaker takes some of the product tolerance. In most applications of fixed-limit gaging, the small loss of product tolerance is negligible and is compensated for by more pieces being made within the product tolerance.

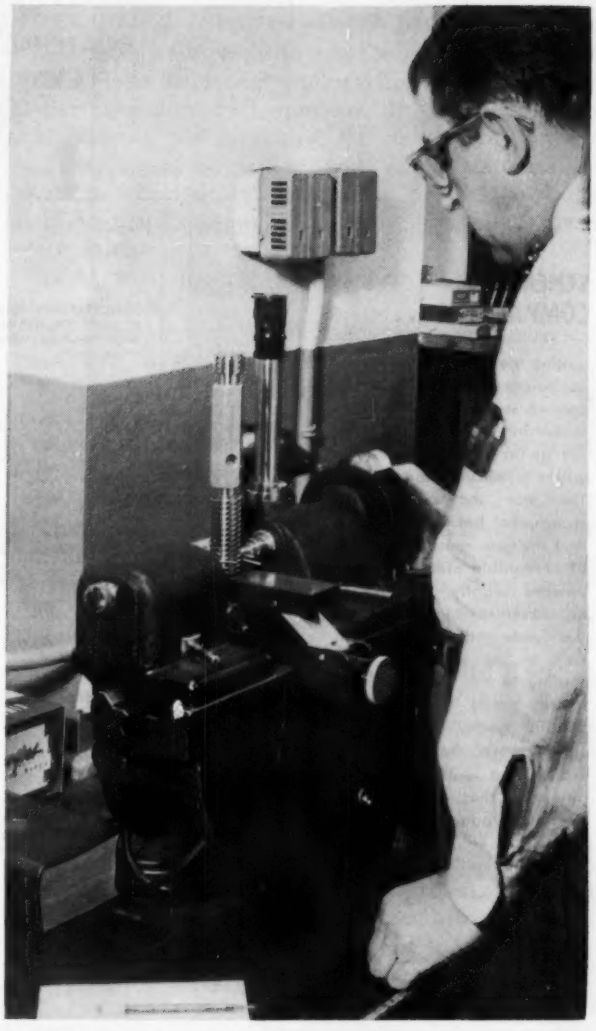
Let us again take the operation of finish-grinding the bore on the shaft seal collar. The size of the hole is 2.0000 in. The product tolerance is plus 0.002 in. minus 0.000 in. The go plug would be the minimum size or 2.0000 in. The not-go plug would be the maximum size or 2.0020 in. Once again, for simplification, we will take only the gagemaker's tolerance into consideration. Using the rule of 10% of the total product tolerance for gagemaker's tolerance, we find that the go plug could be anywhere between 2.0000 in. and 2.0002 in. The not-go plug could be made anywhere between 2.0018 in. and 2.0020 in. If the gagemaker took all of his tolerance and made the go plug to 2.0002 in. and the not-go plug to 2.0018 in., the actual product tolerance limits would be reduced by 0.0004, thus making an actual product tolerance of 2.0018 – 2.0002 = 0.0016 in. Thus, although some of the product tolerance is taken for the gagemaker's tolerance, all accepted pieces will be well within the product tolerance. Rarely will the problem of encroachment between mating pieces arise.

Commercial gaging policy

Commercial gaging policies take several forms. All of them differ and each has its advantages. We will discuss one that is used for plug gages and one that is used for ring gages.

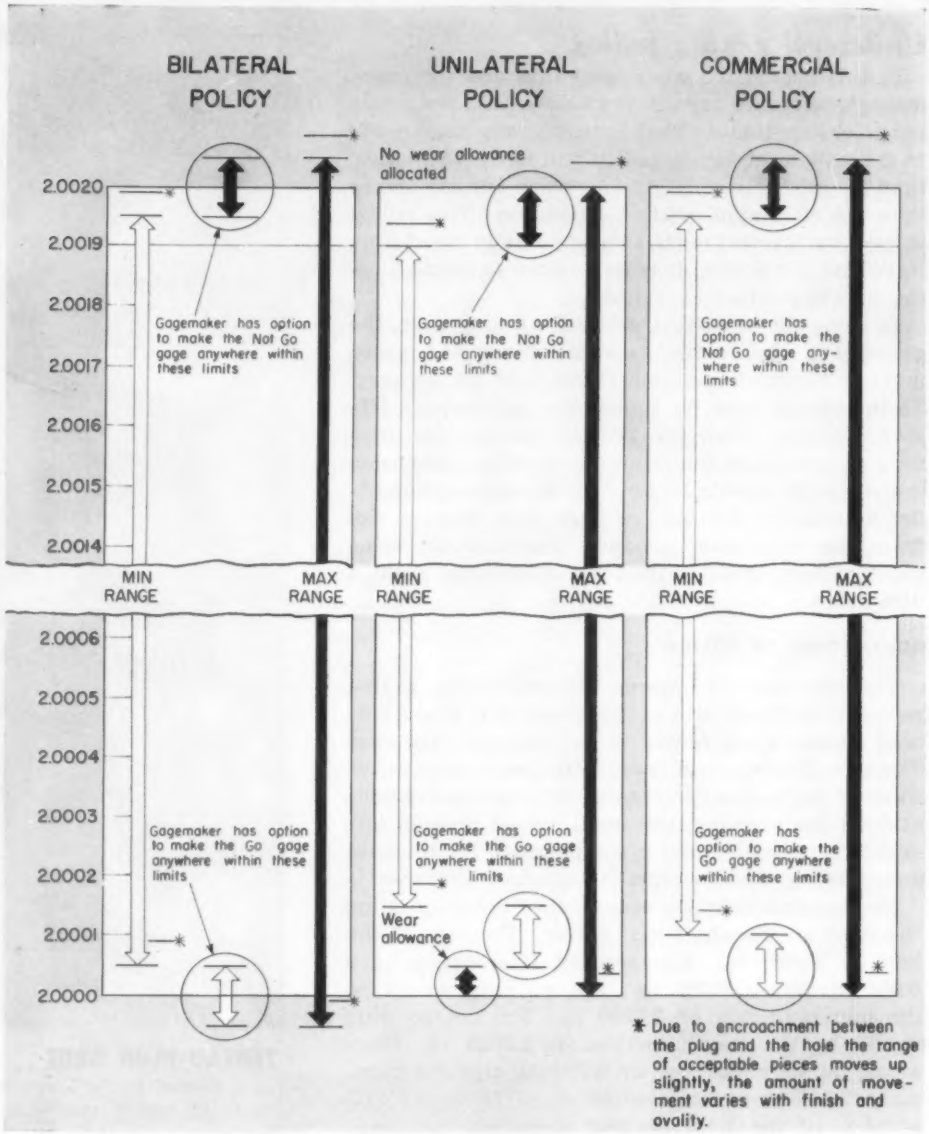
In the commercial gaging policy for plug gages, the gagemaker's tolerance is applied *plus* in reference to the go plug. The gagemaker's tolerance for the not-go plug may straddle the maximum product-tolerance limit. This means that the go plug may vary in sizes from the minimum product dimension to some point slightly larger than the minimum product dimension. The not go plug may vary in size from some point smaller than the maximum product dimension to some point slightly larger than the maximum product dimension.

If the gagemaker takes any of his tolerance for the go plug, the pieces that are accepted by the go plug will be well within the minimum product tolerance limit. If the gagemaker takes his tolerance *minus* on the not-go plug, the pieces that are checked by the not-go plug will be well within or equal to the maximum product-tolerance limit. If he takes his tolerance plus on the *not-go* plug, the pieces that are checked will be equal to or slightly outside of the maximum product tolerance limit. This policy will give production a little more range to work with, but will not insure keeping the pieces as close



THREAD PLUG GAGE ...

... is checked by the 3-wire method, using a Pratt & Whitney measuring machine capable of direct measurements to .10 millionths


BILATERAL POLICY
UNILATERAL POLICY
COMMERCIAL POLICY
No wear allowance allocated
2.0020
2.0019
2.0018
2.0017
2.0016
2.0015
2.0014
Gagemaker has option to make the Not Go gage anywhere within these limits
Gagemaker has option to make the Not Go gage anywhere within these limits
Gagemaker has option to make the Not Go gage anywhere within these limits
MIN RANGE
MAX RANGE
MIN RANGE
MAX RANGE
MIN RANGE
MAX RANGE
2.0006
2.0005
2.0004
2.0003
2.0002
2.0001
2.0000
Gagemaker has option to make the Go gage anywhere within these limits
Gagemaker has option to make the Go gage anywhere within these limits
Wear allowance
Gagemaker has option to make the Go gage anywhere within these limits
* Due to encroachment between the plug and the hole the range of acceptable pieces moves up slightly, the amount of movement varies with finish and ovality.

SCHEMATIC COMPARISON ...

... of the effect of three gaging policies on the product tolerance spread. Circled arrows show that the gagemaker has the option to make the go or not-go gage anywhere within the limits stated. The star shows that encroachment between the plug and the hole causes the range of acceptable pieces to move upward slightly, the amount of movement depending on the finish and ovality of the hole in the workpiece. According to this chart, the unilateral policy employed for Mil-Std gages sacrifices a small part of the product tolerance, but avoids accepting any piece that is beyond the tolerance range

to the center of the product tolerances as the unilateral gaging policy.

In the Commercial Gaging Policy for ring gages, the gagemaker's tolerance is applied *minus* in reference to the go ring and minus in reference to the not-go ring. This means that the go ring may vary in size from the maximum product dimension to some point slightly smaller than the maximum product dimension. The not-go ring may vary in size from the minimum product dimension to some point slightly smaller than the minimum product dimension. If the gagemaker takes any of his tolerance for the go ring, the pieces that are accepted will be well within the maximum product tolerance limit. If he takes any of his tolerance for the not-go ring, the pieces that are checked may be equal to or outside of the minimum product-tolerance limit. This policy will accept more pieces that will never reach the maximum product-tolerance limit.

Selection of a plan

There are many combinations of these policies. The task was to select the one best suited for York operations.

At the start of our investigation, we estimated the project length from six months to a year. We did not foresee the amount of data we would have to collect and evaluate. Every source experienced in the making or checking of gages was asked for information on gaging policies. Sheffield Corporation publishes a booklet that was extremely helpful to us. The Ordnance Gage Center of the Frankford Arsenal and the Navy Ordnance Plant in our own community contributed much information. Various other gage companies supplied information and advice. Within our own organization we solicited and received valuable information that had a bearing on the matter.

Collection of data on gaging policies served an-

other valuable purpose. The product designer, the industrial engineer, the inspector, purchasing personnel and foremen became aware of their mutual interdependence on gages, and the effect of gaging on their functions.

CHARTS EXPLAINED POLICIES

Charts and graphs were made to show various examples of gaging and how each gaging policy affects the pieces being gaged. Merits and limitations of each policy were argued. We then pitted one policy against another, attempting to see how each would affect a production run of pieces; that is, how many "good" pieces we would accept and how many "bad" pieces we would reject; how mating parts would assemble, and how interchangeability was effected. Here again visual aid charts were made depicting the policies. These charts were shown to other persons of our organization to get their opinions.

The final decision was based on the answer to these questions:

1. What policy would be best for our organization, balancing expense against improved performance?
2. How would our choice of policy affect our vendors and their costs?
3. What effect would the new policy have on our current and existing work?
4. Would our choice be compatible to other groups in our organization?

The unilateral gaging policy appeared to be the solution. Our reasons for this decision will be stated later.

Presenting the proposed plan

We were now ready to ask the engineering, production and industrial engineering and purchasing departments for final opinions. In letters to these departments we explained the advantages of the unilateral gaging policy and gave examples to show its effect on our pieces. In several meetings held to clarify the proposal, questions like these were raised:

1. At what point would a gage be rejected because of wear?

We agreed that when the gage was worn to basic size, it should be taken out of service.

2. At what point is it necessary to use indicating gages?

We agree to use indicating-type gages for most applications that have a product tolerance of less than 0.001 in.

These meetings won support for acceptance of the unilateral gaging policy for fixed-limit gages. To put it into effect certain agreements were necessary. First, plug and ring gages for new designs would be ordered to the unilateral gaging policy. Second, when replacements were needed for existing gages not of the unilateral type, Quality Control would consult all interested departments before making a change. Further, periodic statements covering such cases would be issued.

Our reasons for adopting the unilateral gaging policy were varied:

1. A review of our product tolerances and our machine capabilities showed that taking a small amount of the product tolerance would not inflict a

GAGE SUBSTATIONS ...

... perform many different inspections on gages removed from production periodically. Here one inspector is checking a dial bore gage while the other checks a micrometer. Acceptable or repaired gages are sent to the toolcrib for re-issue the next time production gages are to be inspected.

handicap on production in most cases that come up.

2. The pieces accepted would always be within the product tolerances limits. This would also give us pieces dimensionally closer to the center of the product tolerance, which is the ideal condition.

3. The problem of "encroachment" between mating pieces was minimized because none of the acceptable pieces would ever reach the extreme limits of the product tolerance.

4. Our policy would be in line with the policies of military groups. Consequently, if we ordered plug and ring gages to the Mil-Std handbooks they could be used on our line of work or on ordnance material without fear of conflict.

5. By ordering gages to Mil-Stds, we would economize. All gage-making companies have copies of the Mil-Stds. This enables them to tell at a glance just how much wear allowance and gagemaker's tolerance they are allowed. This also saves a great deal of effort for the person who is ordering the gage, because there is no need of a sketch or long explanation as to what size the gage should be made. Less confusion would result when we could order our gages by number from a handbook.

6. The policy would create few field-service replacement problems.

CHOOSE YOUR POLICY

By this summation of what we went through to adopt a plug and ring gage policy, we have attempted to pass along our experience and the highlights of our investigations. Undoubtedly, some people will differ on choice of policy; they may not agree with our explanations of the different policies. That is all right. We cannot pose as authorities on operations beyond the confines of our plant. You must resolve what is best for your organization.

To persons interested in establishing a gaging policy or reviewing their present policy and considering a change, we must add a warning. Study each policy carefully. Each one has certain advantages. Adoption and use of the wrong policy can inflict penalty on production and become a nuisance to everyone involved.

OBTAIN SHOP OPINIONS

Your past practices will have a tremendous effect on the direction in which you can move. When you have collected and evaluated sufficient data, obtain opinions of your design, industrial engineering, production and purchasing departments. Then explain your choice of policy by means of charts and graphs. Simplify the subject to the fundamentals so that everyone can understand them. These exhibits will minimize misunderstandings on gaging of your products, once your policy has been adopted and put into use.

Your product-design department will be one of the places where it is of great advantage to avoid misunderstandings about gaging. When the designer bases his calculations of fit and tolerances on a gaging policy which is the same as that used by all other departments in your organization, the resulting product is certain to be of greater dimensional consistency. Consequently, the product will be of greater functional quality. And, in the last analysis, that is what you and we are constantly striving to achieve.

GAGE BLOCKS ...
... the backbone of the Gage Laboratory, are frequently checked with a Sheffield Precisionaire gage-block comparator, that can read 0.000001 in. Some masters are even checked this way, while others are sent to the U S Bureau of Standards for recalibration

Round Table

Show diplomas here

"They run this plant like a damned government bureau—all red tape and no sense whatever. The latest thing, Al—Personnel refuses to hire a guy I sent in. And after I wasted half a day Saturday, on my own time, talking him into applying for the job. How's that for gratitude?"

"Sounds like they don't think much of you as a personnel man, Ed."

"Well I know a lot more about toolmakers than they do, you can bank on that. If they're not going to take my word, whose are they going by?"

"Beats me, Ed. What was the reason they gave you—if any?"

"They said they wouldn't hire him because he never went to high school. It's company policy, evidently; and it fits right in with some of the other silly orders they have around here."

"I can see a lot of sense in that, Ed. After all, why hire a guy with poor education when practically everyone finishes high school these days? You can find another man—with diploma—if you look."

"What's a diploma got to do with a guy's work? He doesn't have to be a genius to handle a machine. The guy can read blueprints—what more do you need?"

"You might need plenty more, Ed. Suppose he can't read well, and gets mixed up on a job order. You can't be looking out for him all the time. Besides, if company policy is to hire only high-school graduates, everything is going to be graded for high-school graduates—and your man could easily run into trouble."

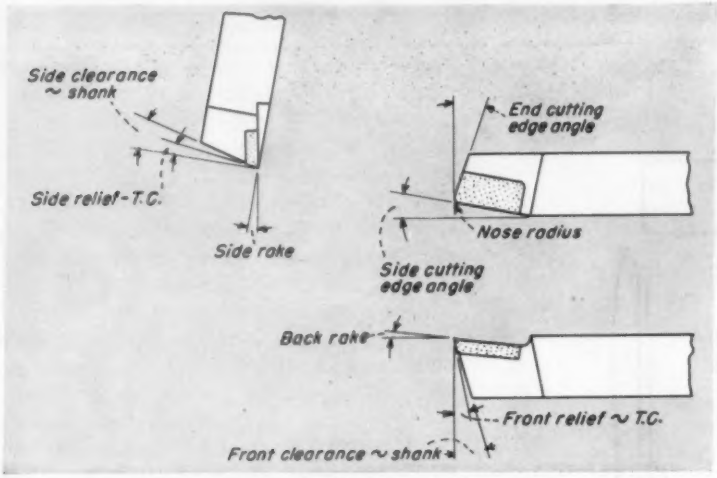
"Look, Al, all I want the guy to do is run a machine, not mastermind the next executive-board meeting."

"All right, Ed; but why not get a man who has at least the minimum requirements; that is, if you're not afraid he'll beat you out of your job in a couple of years."

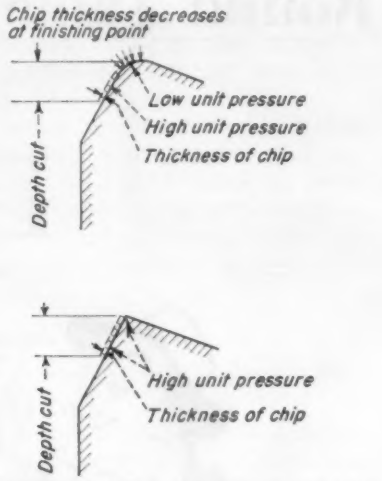
"Oh, cut it out, Al. You still haven't proved that a high-school education is necessary for a mechanic."

"I can't prove it, Ed; but would you want to hire a diemaker that only knew how to make round dies?"

***SHOULD** a fixed minimum on education for shop men be set? Should Ed be allowed to waive the education requirement if he wants to? Your opinions on the subject may help others. Discussions of earlier topics start on page 188.*



CONVENTIONAL CARBIDE-TIPPED TOOL DRAWINGS carefully specify the various angles, but the nose radius is usually any old figure that comes into the designer's mind. Actually, its dimension is important to finish and tool life



NOSE RADIUS produces a chip of decreasing thickness, causing lower unit pressure at the weakest point of the tool. Pointed tool produces parallel chip with high unit pressure at the point, which causes rapid breakdown of the point

What size nose radius?

ROBERT E NIXON, service engineer, ADAMAS CARBIDE CORP, KENILWORTH, N J

Carbide lathe tools usually consist of a piece of carbide brazed or clamped to a steel shank. The shank is milled to produce a tip pocket, side cutting-edge angle, end cutting-edge angle, side and end clearance, and side and/or back rake. After brazing, the tip is ground to produce the proper side and end relief, and last but not least, a nose radius.

The nose radius is usually the last item mentioned in any description of a tool. In most cases, the name is just mentioned; seldom is any information given about it. Occasionally, you will see a figure alongside the word "nose radius," such as 1/32 or 1/16. But in most cases this figure has no rhyme or reason supporting it, other than that there has to be a figure there.

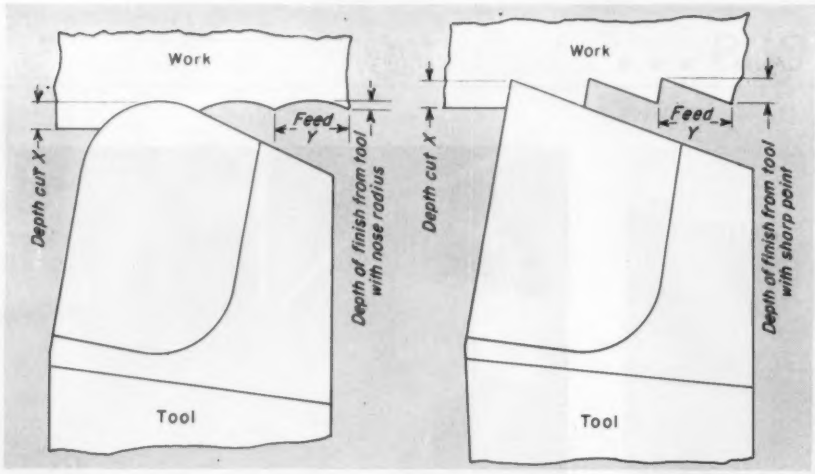
Actually, the nose radius has a definite function and, to appreciate this, we must first understand how the nose radius is constructed, what it does in the operation of the tool, and then determine what size radius should be used for different conditions and materials.

The nose radius is formed on the corner of the tool, where the end-cutting-edge and side-cutting-edge angles meet. It will vary in size and have varying degrees of clearance, but it should always be tangent to the end-cutting-edge and side-cutting-edge angles. In most cases it is formed on a tool grinder. If the radius is large, it is usually formed or roughed in with a silicon-carbide wheel, then finished with a diamond wheel. If it is small, it can be formed with a diamond wheel. A good grinder hand will usually form the radius offhand with a metal-bonded diamond wheel, setting the grinder table at the correct clearance angle and coming up with a finished radius with just a few strokes of the tool across the wheel.

Now let us determine what the nose radius does in the operation of the tool. There are two reasons for it. The most important is to strengthen the weakest point of the tool. The second reason is to produce a better finish on the work.

Whenever an angle formed by two surfaces of a carbide tool is 90° or less, we encounter a weak point in the tool where the minute particles of tungsten carbide can be readily broken away from the large mass of the tip. To overcome this condition, usually encountered where the end-cutting-edge and side-cutting-edge angles meet, we grind a nose radius. This strengthens the tool by removing the small mass of fragile particles protruding at the point. The nose radius also decreases the thickness of the chip, which, in turn, reduces unit cutting pressure at the point. This lower unit pressure greatly reduces the possibility of tearing out minute particles of the carbide near the finishing portion of the tool.

The effect of the nose radius is to produce a better finish on the part. The finish produced by a nose radius is a scalloping effect, whereas the finish produced by a sharp-pointed tool is a saw-tooth effect. If both tools are run under the same conditions, that is; the feed, speed, depth of cut, and material being machined are identical, the scalloping effect will be relatively shallow as compared to the saw-tooth effect. This scalloping effect gives the appearance of a much better finish on the work, and also produces a much stronger part. As every engineer realizes, a fillet corner is much stronger than a sharp one. The sharp corner produced



SCALLOPED EFFECT produced by nose radius gives better surface finish, shallower scratches, and a stronger workpiece with less tendency to crack at sharp corners

by a sharp-pointed tool, when feeding across the work, inherently produces a weak point at which the work could develop a crack and fail.

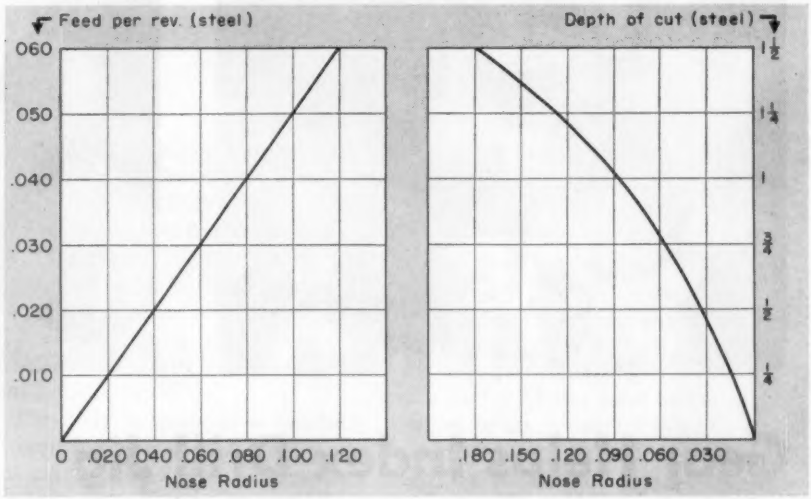
In establishing a nose radius, there are certain points to be remembered:

A relatively large nose radius will invariably cause chatter. There are two reasons for this. The first is the excessive length of contact between the cutting edge of the tool and the work, as compared to a tool of the same style with a small or no radius machining the same depth of cut. The other reason is that the chip produced by a large nose radius is non-uniform in thickness. The longer, tapering chip, will produce chatter faster than the shorter, uniform-thickness chip produced by a small nose radius.

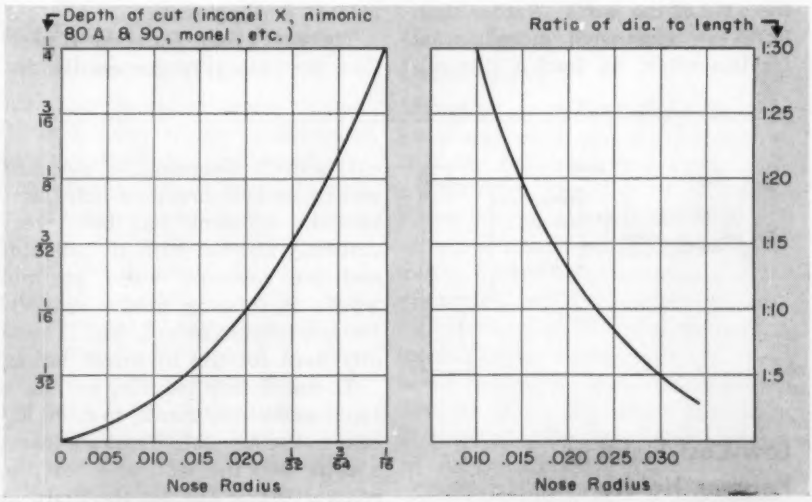
A large radius will work without producing chatter, provided a heavy, rugged tool is used and the workpiece is held rigidly. The ratio of work diameter to length should be of such a value that it does not cause chatter.

A small nose radius should be used if the work is not held rigidly or if the length is excessive in relation to diameter.

The accompanying charts, compiled by the writer, give the recommended nose radii for carbide tools for various conditions and materials.

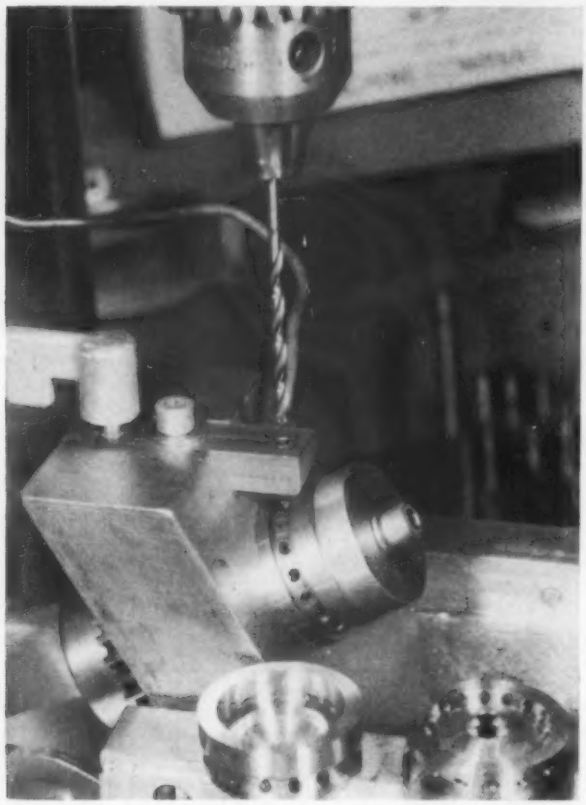


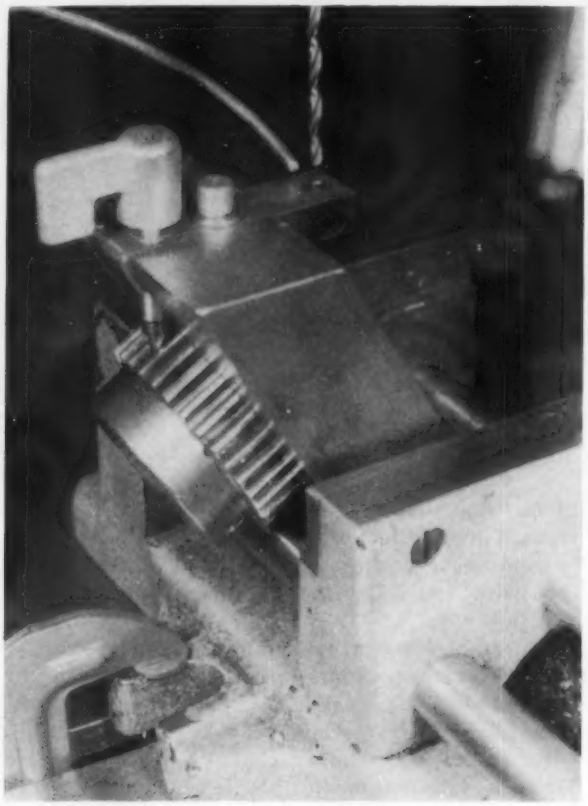
DETERMINE NOSE RADIUS for machining steel from both charts. For interrupted cuts or rough forgings, use the larger radius. For continuous cuts or work previously roughed out, use the smaller radius



FOR NICKEL ALLOYS, use LH chart to obtain nose radius. Use RH chart to obtain radius when machining long, slender work which would normally chatter because of the excessive length/dia ratio

Practical Ideas . . .

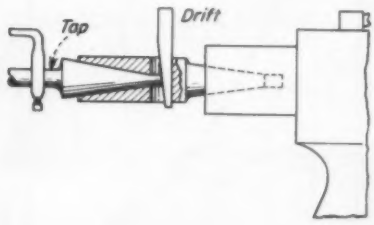




Gear Helps Index Drill Jig

We had an order for 50 pieces which had to be drilled with 16 equally-spaced holes at an angle to the axis of the work. Rather than build an expensive indexing jig for this work, we used a 32-tooth gear to locate the pieces. One bushing did all the holes, and each piece required only about 5 minutes of drilling time.

The part is not clamped in position, because pressure on the indexing pin is enough to hold the work in place. The holes were easily located within the 0.002 in. of true position required for the work. *J C Magee, Schenectady, NY*

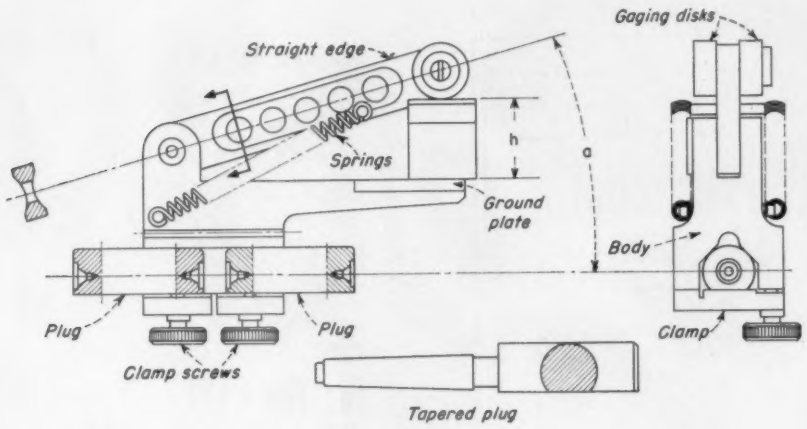


Low-Cost Floating Reamer Holder

Taper-shank reamer holders held in the tailstock of a lathe often cut several thousandths oversize, and cause bell-mouthed holes, unless the tailstock has been very carefully aligned with an indicator and the machine ways are not worn. A floating holder corrects for any misalignment, but is usually kept for use in turret lathes.

To avoid this trouble, we use a taper extension shank, to have access to the keyslot. Then we insert a drift into the slot, and rest the reamer shank against the drift, so the reamer has about 0.005 in. play in each direction. The tang of the reamer shank is in the tang slot, which keeps the tool from rotating. Keyslot and drift are horizontal, so the drift will stay in place without being held. To retract the reamer, a dog may be fastened to the shank of the tool. With a few minutes practice, this method does not take any longer than conventional practice, and gets much better results.

This arrangement looks very simple, but it has saved us a great deal of trouble, at low cost. *H Landauer, Tampa, Fla*



Spring-Loaded Bar Helps Set Tapered Tools

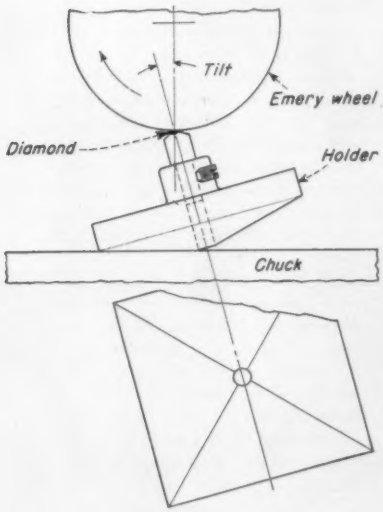
The inaccuracy of the graduations for controlling the swiveling of grinder tables or lathe compounds makes it impossible to obtain immediately an exact taper angle or a perfect cylinder. The machinist must usually spend some time tapping back and forth and checking the results with conventional gages. The big danger in this lies in the fact that there may not be much metal to spare, and if he taps a little too hard the work may be ruined.

This gage permits quick adjustment of the relative movement of the work and the tool or wheel to obtain a perfect cylinder or required taper. It is particularly useful for inside tapers, which are always difficult to check. It operates on the principle of setting a straightedge by using the sine of the required angle, and setting the tool parallel to it.

The body consists of a carefully ground V-block in which plugs can be clamped by the clamp and screws. These plugs are of various lengths and have their centers carefully lapped and protected by counterbores. To counteract errors or wear in the machine, the distance between centers is carefully adjusted to correspond to the length of the workpiece when this is held between centers. If the work is to be held in the machine spindle, a tapered plug is used in place of the cylindrical plugs.

The straightedge, drilled for lightness, must be dead true and is pivoted on the pin. At 4 in. from the pin, gaging disks are attached to the straightedge. These must both have exactly the same diameter, and this must be such that when a 0.05-in. gage block is placed between them and the ground plate, the edge of the straightedge will be parallel to the axis of the plugs. Two springs hold the disks firmly against the gage blocks.

To use the gage, insert gage blocks between the disks and the plate to incline the straightedge to the desired angle. The height of the blocks is found by the formula: $(4 \times \sin a) + 0.05$ in., a being the required taper angle. By means of a dial indicator held in the toolholder or on the wheel spindle, adjust the table or lathe compound until it is parallel to the face of the straightedge. *Charles Minaire, St Etienne, France*



Four-Facet Diamond Holder Cuts Diamond Wear

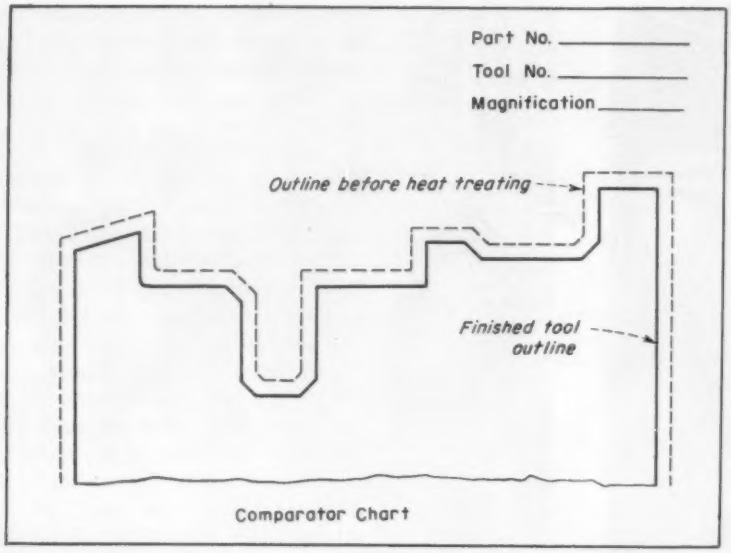
This four-facet diamond holder will add considerably to diamond life when dressing grinding wheels. Because one facet at a time is held on the magnetic chuck, the chances are only one in four that the same side of the diamond will be used twice in succession. This will equalize wear on the diamond. The facets can be numbered to keep track of which surface should be used next, if that is desired.

This would mean, though, that some record would have to be made of which facet had been used the previous time. *C A Guerrera, Grosse Point, Mich*

Gear Train Converts Lead Screw

Mounting a milling head on the crosshead of a planer, we found that the crosshead lead screw had a 6 tpi pitch. One turn of the leadscrew moved the head 0.1667 in., so we attached a 3:1 gear train to the screw and mounted a dial graduated in thousandths of an inch on the stud. With this arrangement, three revolutions of the screw moved the dial one revolution, or ½ in. The gears used are 32-pitch precision instrument gears of 180 and 60 teeth.

This arrangement saved us from a most difficult problem. *John J Fitzgerald, Ithaca, NY*

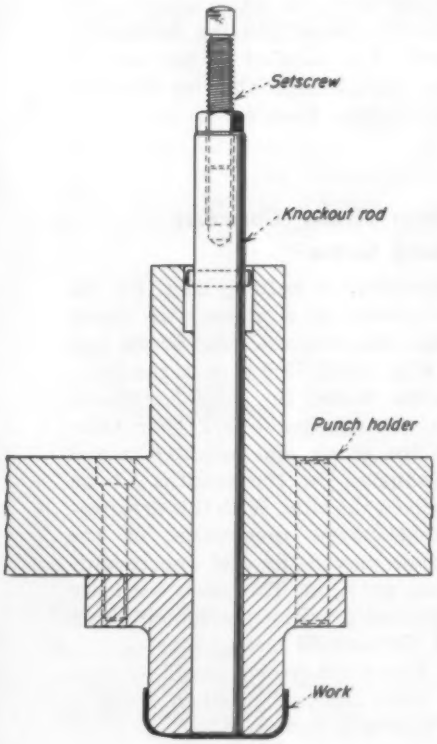


Comparator Chart

Comparator Chart For Form Tools

When we have to make complicated form tools, we use a comparator chart which insures that we will not unintentionally make some of the dimensions too small, so that, when the tool is finished, parts of the tool are undersized.

To avoid this, the chart shown here is used. It is simply an outgrowth of the standard chart which checks the finished tool, but tells how much stock to leave on the tool before heat treatment. *F Buehler, Rochester, NY*



Adjustable Positive Knockout

When making dies that must be equipped with a positive knockout, it is sometimes hard to find the correct length of the knockout rod, so the part will be ejected from the punch. In some cases, the dies are built in another plant, some distance from the machine where they will be used. Then the knockout length may not be readily available. Also, a die might have to be run on a different press, on which the knockout bar is not the same.

This problem can be easily and inexpensively solved by drilling and tapping the end of the knockout rod and inserting a square-head setscrew and jam nut. This will permit easy up and down adjustment to get the desired length. The setscrew, which is hardened, also eliminates the need for hardening the knockout rod. *Roger Isetts, Kenosha, Wis*

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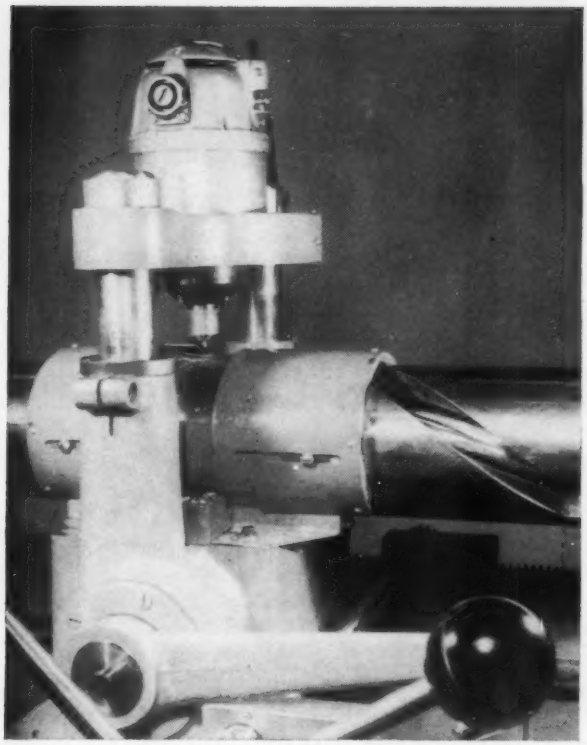
Routing Head Mills Recoil-Rod Grooves



CLOSEUP SHOWS ROUTING HEAD, star wheel, and a sample groove in guide which surrounds work. Work can be seen through one slot in guide-groove

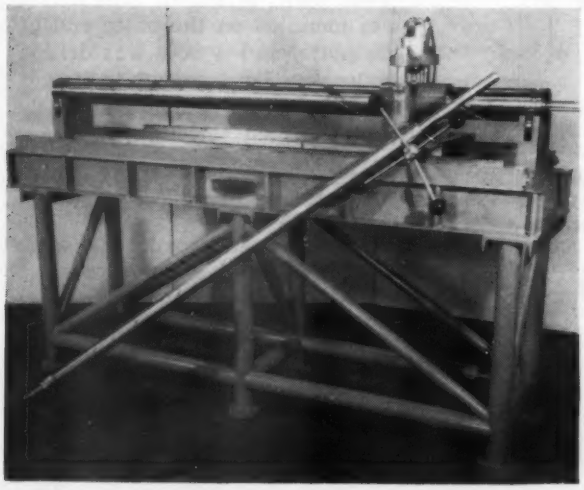
About a year ago we received a contract which included a recoil metering rod which had 4 longitudinal grooves (right- and left-hand) and 46 spiral grooves for lubrication, spaced intermittently along the rod. The quantity was high enough to make production tooling worthwhile, so we milled the four long grooves with a set of profile masters and cams controlling a rise-and-fall duplex milling machine.

The 46 spiral grooves presented more of a problem, because conventional milling with a gear-driven dividing head would be too costly. Instead, a single-purpose machine was designed and built, simple enough to be economical, yet fast enough for the job.

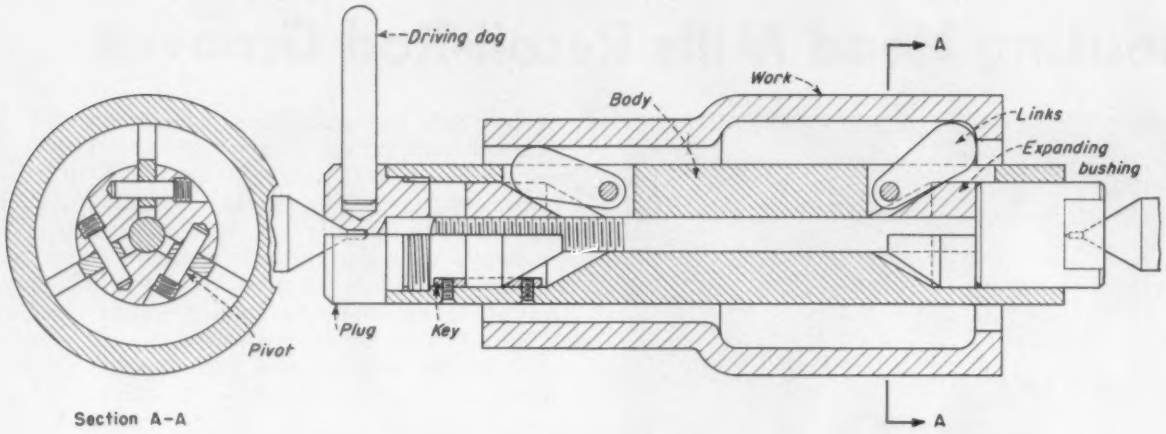
A simple weldment formed base and ways, using commercial parts whenever possible. Standard gear racks and pinions provided longitudinal feed, and a pump-type drill jig carried a standard 1¼-hp routing head which carried a ½-in. chuck. The profile master was made of three sections of tubing, machined and assembled into a single unit. The profile master is free to turn on ball bearings which run in a circular track.

In operation, the end cap of the profile master is removed, the part is inserted and located on banking points, and the cap is replaced. The operator then positions the router head roughly over the first slot, and lowers the router head into the slot. A stationary piloting diameter immediately around the cutter locates in the slot. As the router continues downward, a precision limit switch starts the motor when the cutter is about ⅛ in. away from the work. Depth of cut is regulated by a positive stop. By moving the router carriage longitudinally, the router, guided by the profile master, cuts the groove to required length, depth, and width. This is repeated for all the grooves.

Besides paying for the cost of the machine, less tangible savings also resulted. Less skilled operators were required. A milling machine was freed for other work. Operating cost for the router head is considerably less than for a milling machine. Handling costs were cut, because the machine could be located adjacent to other machining operations on the same pieces. *Method-Tool Design Group, American Machine & Foundry Co, Brooklyn, N Y*



OVER-ALL VIEW of machine, showing the position of the routing head and details of construction. Part standing against the machine has grooves finish-milled



Section A-A

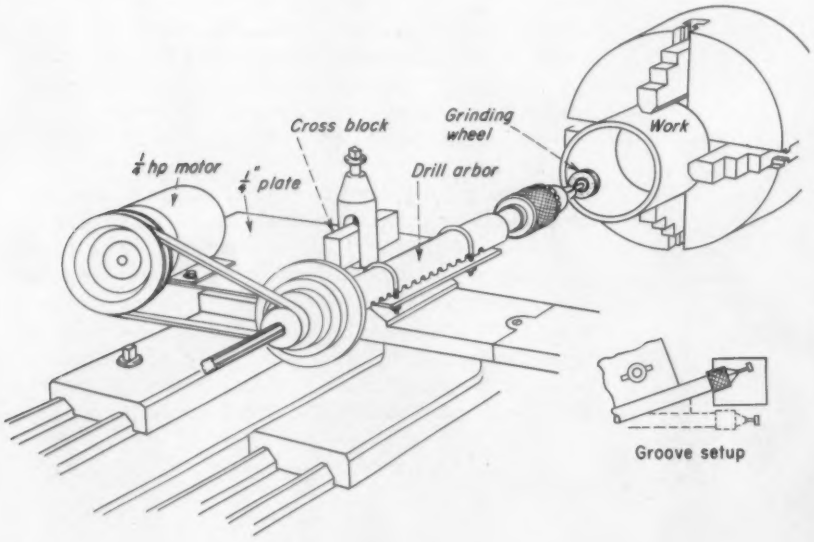
Expanding Mandrel Holds Two Diameters

THIS MANDREL was designed to hold on the inside diameters of thin work, such as hollow castings, so that when the OD was turned, the wall thickness would be fairly uniform. As can be seen, the mandrel holds on two different diameters, each set of links expanding until it contacts the work, regardless of the diameter at the other end of the work. Tightening one bolt brings both sets of links into play.

The mandrel body is cylindrical, and is bored out at each end to accommodate a pair of conical expansion bushings which are pulled together by the central clamp bolt. The left-hand bushing is internally threaded, and is prevented from rotating by a key.

One end of the clamp bolt has an enlarged cylindrical portion which is a sliding fit in the recess in the end of the mandrel body.

The work locators are two sets of 3 pivoted flat steel links which are hardened. The links should be finish-machined in a stack, so they will be exactly alike. *C T Bower, London, England*



Dismantled Hand Drill Drives Grinding Wheel

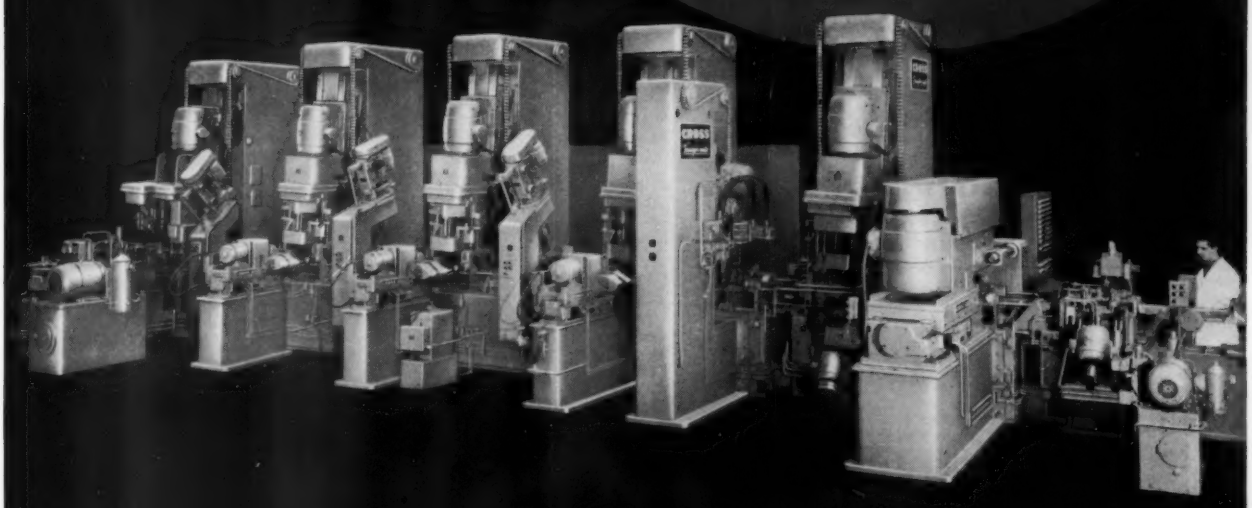
SOME time ago we had to finish the ID of a steel bushing, and lacked the proper equipment for the job. Instead, we dismantled our ½-in. electric hand drill, and mounted the arbor on one end of a piece of ¼-in. plate, as shown. The motor was mounted on the other end of the plate, and a hole was drilled in the plate large enough to fit over the toolpost. A bridge enabled us to clamp the fixture tightly, once it was in place. Then the grinding wheel was held in the drill chuck, and the work was easily finished.

When we had to do the same kind of work on a narrow groove, with a small wheel, we swung the fixture at a suitable angle, as shown.

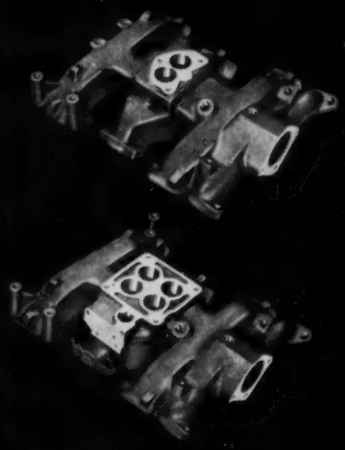
Use of the cone pulleys gives us a wide range of speeds for the grinding wheel. *Angel A Ayala, Monterrey, Mexico*

Another Transfer-matic by Cross

Mills, Drills, Bores, Taps, 2 and 4 Barrel Intake Manifolds



- ★ Rough and finish mills carburetor pad; mills choke pad (4 barrel only); bores carburetor port holes; drills and chamfers all holes (except 3 holes in water outlet pad); and taps all holes.
- ★ 140 pieces per hour at 100% efficiency.
- ★ Initial part location from port openings.
- ★ Push-button changeover from 2 to 4 barrel carburetor.
- ★ 13 stations; 1 loading, 11 working, 1 unloading.
- ★ Lift-and-carry type transfer mechanism.
- ★ Pre-set tooling throughout.
- ★ Other features: construction to J.I.C. standards; complete interchangeability of all standard and special parts for easy maintenance; hardened and ground ways; drag chain type chip conveyor.



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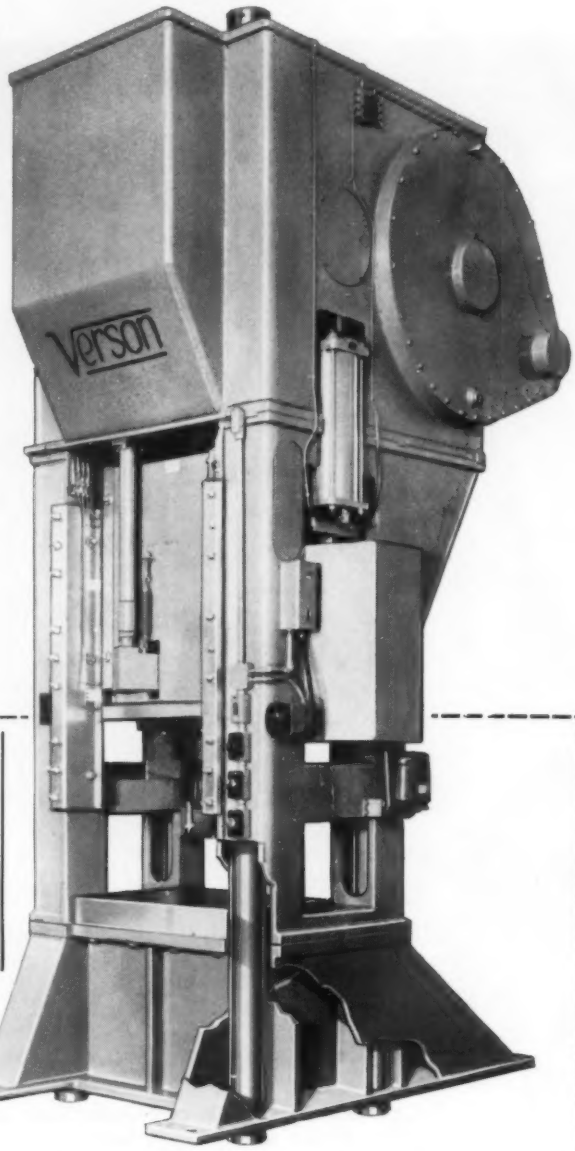

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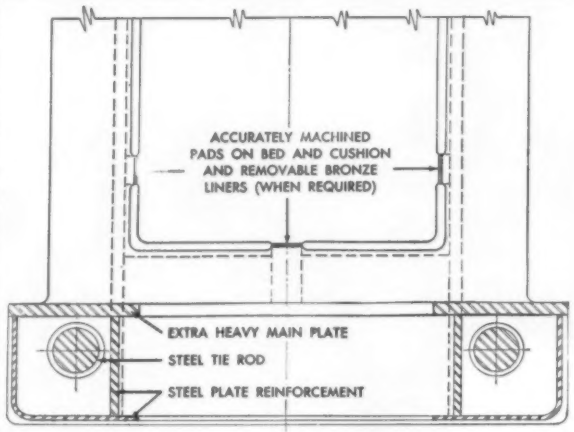
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HOLE-RELATION GAGES...I

WILLIAM H HONEMAN, design checker, SANDIA CORP, ALBUQUERQUE, N M

Hole-relation gages are important tools used in the production of interchangeable castings and fabricated parts to check the center distances of drilled, threaded, reamed and bored holes.

In designing and constructing gages of this type it is essential to use the "mean dimension" of the "piece part" for the gage and to allow 10% of the total piece-part tolerance (assumed general drawing tolerance ± 0.005) or ± 0.0005 as the gage tolerance for center distances.

For example, if the piece-part drawing showed a dimension of 1.500 ± 0.005 as the distance between hole centers, the gage drawing would call for a dimension of 1.5000 ± 0.0005, or if the piece-part dimension was $1.5000^{+0.004}_{-0.000}$ the gage dimension would be 1.5020 ± 0.0004.

The piece part can be drilled in a drill jig or on a jig borer and dimensions held to ± 0.0005 or closer as required. This would be the case even though the piece-part drawing showed a tolerance of ± 0.005 between hole centers.

When the gage is placed in position on the part, the pins that do not drop in give an indication of which holes are out of location, and the part is rejected. In the event the part is rejected and a drill jig was used, the latter should be checked for accuracy. See Fig 1.

In other words, the drill jig would be checked in a jig boring machine to find out what holes are out of location, how much they are out and in what direction. When this is known, the drill jig is returned to the toolroom and corrected. New piece parts are then drilled and gaged.

If it is required to check two drilled or threaded holes of a piece part it would be permissible to use

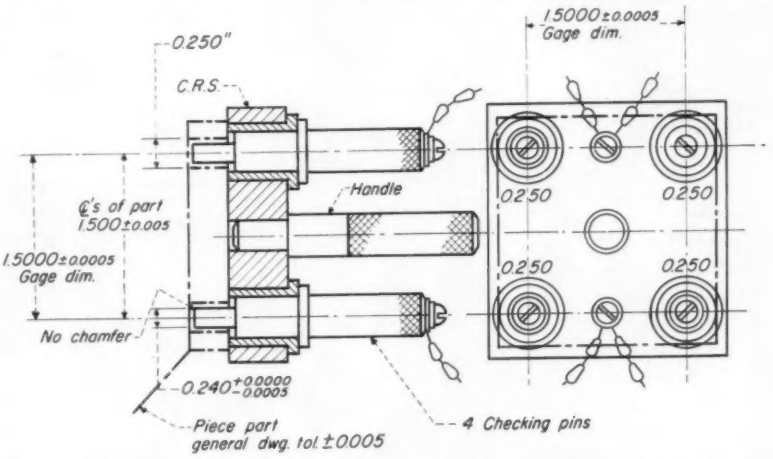


FIG 1 . . . Checking pins are a slip fit, without "shake," in the press-fitted bushings, and should have a length of bearing in the bushings equal to at least three times the pin diameter

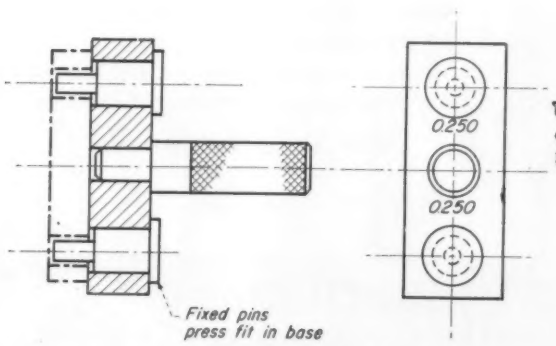


FIG 2 . . . Two fixed pins can be used, when it is necessary to check relationship of only two holes in a part

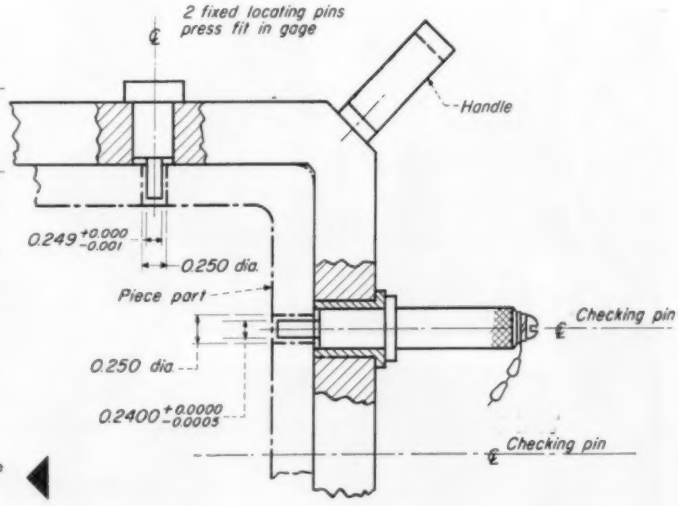
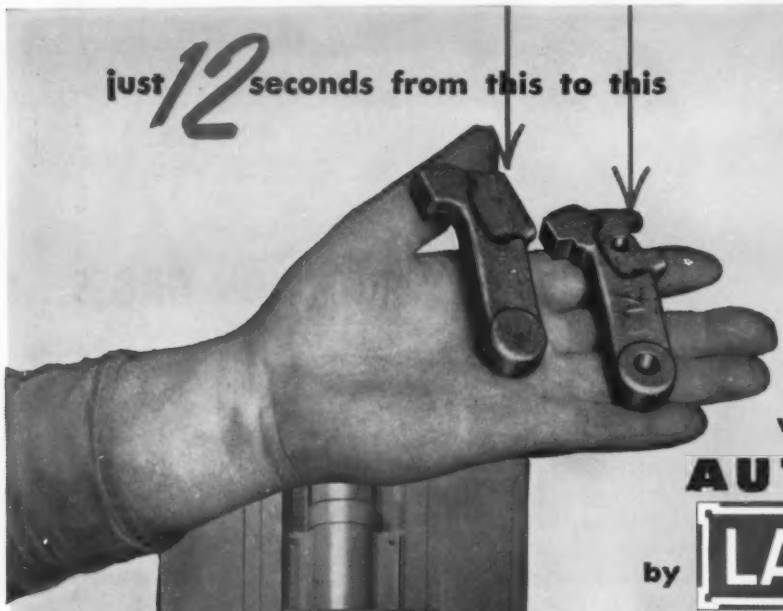


FIG 3 . . . Diameters of the locating pins can be made to the accuracy required by the part manufacturer

just 12 seconds from this to this



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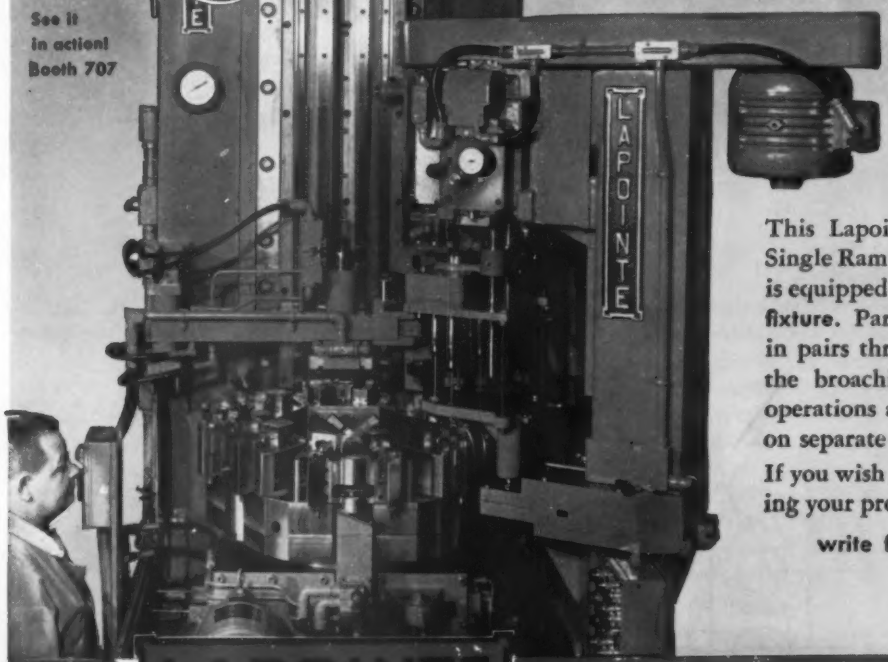

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American Machinist REFERENCE BOOK SHEET

HOLE-RELATION GAGES...II

two "fixed pins" in the gage. See Fig 2.

The checking pins of a hole-relation gage are not chamfered because of the tendency of an inspector to force pins into holes which are close to proper location.

In checking the relation of threaded holes let us assume that the four holes in the piece part of Fig 1 are threaded with a ¼-20 tap and a similar gage is made. To determine the diameter of the checking pins, we must know whether the tap-drill sizes are based upon 75% of full thread as is common or 83 1/3% of full thread as is used by some companies. If 75% is the practice of the manufacturing company, then the tap-drill size for ¼-20 would be 0.201 in., and the pin diameter would be 0.201 – 0.010 (which is the total-piece part tolerance) or 0.191 + 0.0000, – 0.0005. The gage-makers tolerance on these pins of – 0.0005 can be held to minus 0.0002 or – 0.0003 depending on manufacturing-company practice. Note that with "hole-relation gages" we are checking center distances of mounting holes or the location of one group of holes with relation to another group, which are used to mount the same part. See Fig 3.

The pitch diameter of threaded holes would be checked individually with thread gages. Bored holes are checked for size with plug gages and the same applies to reamed holes.

One method of checking the relation of bored holes is by means of a flush pin gage. The construction consists of a flat plate made of cold-rolled steel, if small, or cast aluminum jig and fixture plate, if large, and incorporating flush pins. Because the bored holes are usually held to "tenths" and located from finished surfaces, the checking pins of the gage must also

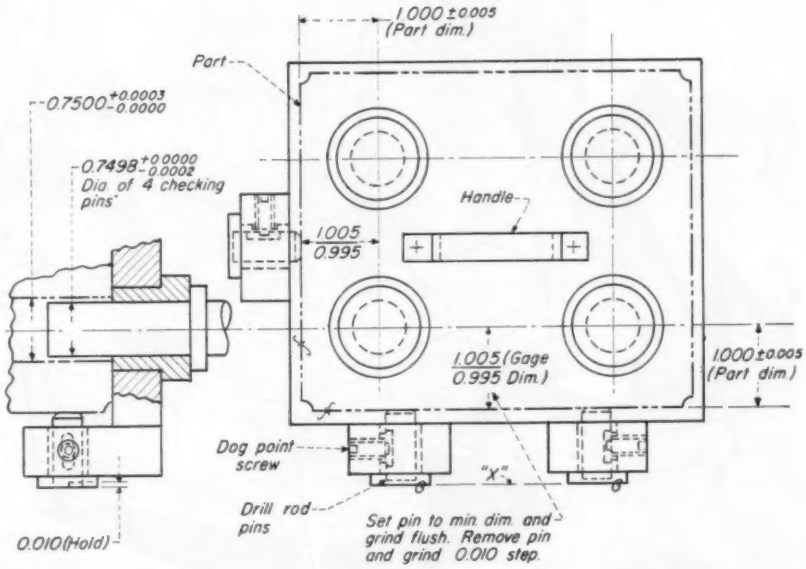

FIG 4 . . . To check the 1.000 ± 0.005 dimension: if the flush pin goes below the surface marked *X*, the part is below tolerance; if more than the 0.010 step shows above *X*, it is above tolerance. Use of two pins on one side to square gage on part is optional. Normally one is used

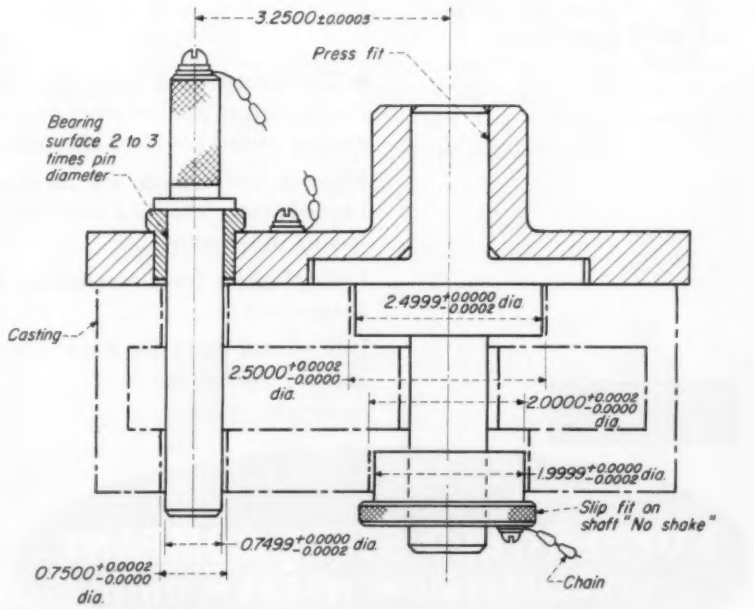

FIG 5 . . . Bores on opposite sides of a casting are checked by a male member fastened to the gage, and a ring gage that has no shake on the shaft

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American Machinist REFERENCE BOOK SHEET

HOLE-RELATION GAGES...III

be held close and the flush pins used to check certain dimensions within the tolerance specified on the piece-part drawing. See Fig 4.

In the event it becomes necessary to check the alignment of bores on opposite sides of a casting, this is accomplished by means of a gage similar to that shown in Fig 5.

It frequently becomes necessary to check spotfaced castings when the spotface is on the inside or in some otherwise partly hidden location. To accomplish this we provide loose pieces chained to the base of the gage with pins long enough to go through the casting and provide a bearing surface on the pins at least one and one-half times the length of the loose piece. The diameter of the checking end can be 0.010 in. under the nominal size, because in this case we are not concerned with checking the size or relation of the spotface. We are interested in making the inspector conscious of the fact that he is to check whether or not the spotfaces have been made where called for on the piece part print. See Fig 6.

The use of brass or plated chains to keep the pins and gage together sometimes become bulky and makes it difficult to use the gage properly, especially when there are a great number of holes to check. In this case we can use a better but more expensive method as shown in Fig 7.

GAGE-CONSTRUCTION SUMMARY

1. All tapped holes are to be gaged to the minor diameter of the thread minus the total piece-part tolerance, using 75% or 83 1/3% of full thread as a basis for the tap-drill size or minor dia.

2. Tolerances on tapped-hole centers to be 10% of the piece-part tolerance but not over ± 0.001.

3. The end of the checking pin which enters the hole should not be chamfered. A locating pin may be chamfered if desired.

4. Drilled holes should be gaged to the minimum diameter of the hole minus the total piece-part tolerance.

5. Commercial or fabricated handles should be included with all gages where practical.

6. Piece-part number, tool number and hole size are to be stamped in appropriate places on all gages.

7. Spotface and counterbore diameters can be checked to minus 0.010 in. but usually the depth need not be checked.

8. Checking or locating pins, if loose, should always be chained or keyed to the gage.

9. Cast aluminum jig and fixture plate of proper thickness is satisfactory for a large gage to reduce the weight. Aluminum castings can be made for large gages. Cold-rolled steel is satisfactory for small fabricated gages. Pins should be oil-hardening tool steel, hardened and ground to size.

10. The piece part should not be rigidly clamped in a gage; it should be free to move to pick up tolerances. If clamps are used they should be only slightly tightened. Hole-relation gages are not made like drill jigs, where the part must be firmly held in place.

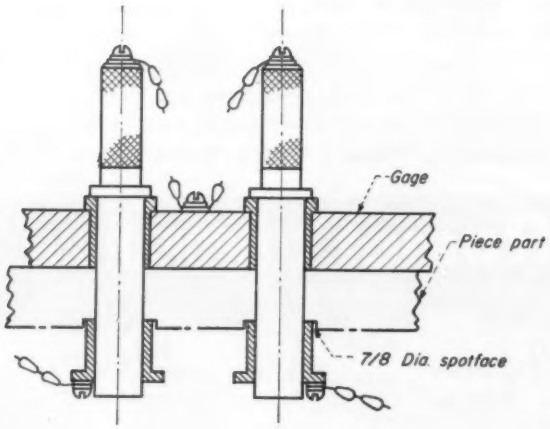

FIG 6 . . . Besides checking hole location, loose pieces are added to the gage so that the inspector will not overlook hidden spotfaces

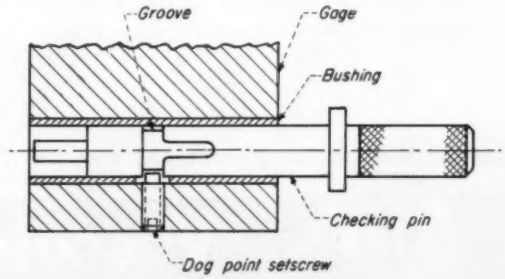

FIG 7 . . . A dog-point setscrew, instead of a chain, retains the checking pin in the fixture, and the slot allows it to be pushed into the hole

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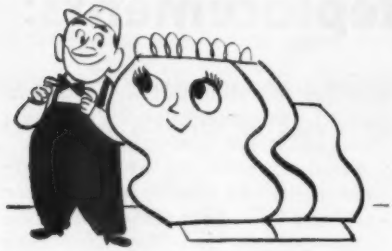
Talking Shop . . .



Eye Appeal

MACHINE TOOLS with eye appeal make for more-enthusiastic, prouder-of-their-work operators. So says J M Little, who heads an industrial design firm in Toledo. As he puts it, eye appeal and pleasing-to-the-touch qualities rank high up with function and maintenance in machine-tool design. His contention that you get more work out of the operator when the machine looks good and its buttons and levers feel good to the touch. Much more than you will with a machine that's so big and ugly it scares the guy who's going to run it.

Local Repair Shop

AN AUXILIARY DIE SHOP, or repair room, right next to the press room will save a lot of lost time for die repairs. Here, broken pins, punches, or springs can be replaced, and other minor repairs made, in a few minutes. If your die shop is some distance away, you can save hours of delay in many cases by putting in an auxiliary repair shop no larger than most toolcribs.

Modern Pied Piper

A SMALL CITY was suddenly beset by a plague of cats. The cat population was increasing so rapidly that the city fathers were beside themselves. As is the modern fashion, they called in a consultant. Said he: "This is a complex problem. It will take my organization three months, and will cost you $18,000." In their desperation, the city fathers were willing to agree to anything.

The report, when rendered, said in essence: "The cause of this tremendous increase is basically the old tomcat who inhabits city hall. He alone is responsible for 59.3% of the increase. We recommend he be taken care of."

The recommendation was accepted, acted upon, and the fee paid. Immediately, the cat population began to decline. It dropped off noticeably for several months, then began again to rise rapidly. So the city fathers recalled the consultant. Said he: "As this is rather an extension of an earlier study, we can complete it in a month, and the fee will be only $12,000."

The work was authorized. The report, in essence: "Remember that big tomcat? You didn't dispose of him; you merely had him altered. Now he is acting as a consultant."

Technicians Needed

SAYS an engineer-editor friend of ours, John Markus of "Electronics" Magazine: "Engineers need more assistants. Ideally, each engineer should have around four technical aides to do his more routine work; but very few have this many. As a result, many engineers are doing assembly work, wiring, soldering, and other simple tasks while drawing salaries as designers and researchers. During 1953, technical institutes turned out only 1,800 technicians trained in electronics, television, and radio, according to one survey."

A Job and a House

HELP WANTED ads now appearing in British publications indicate the difficulty of obtaining skilled engineering personnel. One company advertising for draftsmen stresses the plant's proximity to the Green Belt of Middlesex, Hertfordshire and Epping Forest, and offers full assistance toward the purchase of houses, and payment of removal, legal, and incidental expenses. New employees at the main offices are offered flats and houses for rent, and payment of removal expenses.

Another company offers the opportunity of renting a modern house or flat, and states that preference will be given to candidates who are on an approved housing list in the Greater London area. Most companies are offering high salaries and stressing retirement and pension schemes.

Words to Watch

PROF JOSEPH E MOORE of Georgia Tech finds significance in a tabulation of words that workers used to describe foremen they liked and disliked. Check yourself against these lists:

Best Foremen: understanding—38, fair—23, considerate—17, good leader—10, sincere—7.

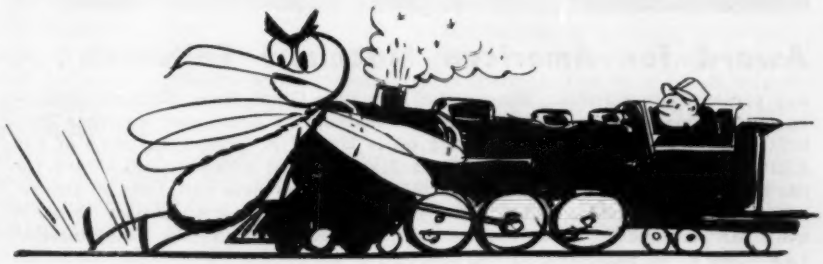
Poorest Foremen: domineering or overbearing—25, unfair—14, egotistical—10, inconsiderate—10, buck passer or evades issues—6.

She's Bushed!

THOMAS & BETTS CO recently figured out that veteran employee Mary Luschuk had reamed and tapped some 206-million malleable-iron electrical conduit bushings. Recently, when the Elizabeth, N J, firm switched to output of a new steel bushing, it made the last of the old ones gold-plated, set it with amethysts, and gave it to Mary.

Mosquitoes

YOU'VE HEARD of trains out West being delayed by swarms of grasshoppers or crickets. Their carcasses on the rails cause locomotives to slip on grades. Now comes a report from Denmark that swarms of mosquitoes settled on the rails of Storsstroneroen Bridge, delaying a freight 90 min. Even with sand to give traction, the wheels slipped, and the 2-mile bridge crossing, usually made in 5 min, took 95 min.



News of Metalworking . . .

BuShips Considers Machine Replacements:

Navy Meeting Hears 5-Year Plan; Mobilization Base

Budget, Air Force, and Defense representatives sit in on discussion of proposal for replacing obsolete machine tools. Bureau of ships undecided whether tools are obsolete or not, and how much so

WASHINGTON—Navy planners are facing the problem of a possible mobilization based on machine tools not up to date, but evidently cannot decide what to do. In a closed meeting, one proponent of replacement suggested starting a plan off with a fifth of the total in the 1957 fiscal budget, using current procurement funds, not reserve-tool money.

Those at the meeting were generally unconvinced that any simple replacement plan could be undertaken. Such a plan might compare mobilization capacity of current equipment against potential of the latest equivalent machine tools, and determine the advantage of new units in floor space, manpower, and costs. One assumption made by the proponent of this design: Mobilization conditions could be assumed to be 2½ working shifts—just for comparison.

Previous attempts at fitting replacements to a master plan of some sort have been discarded—one reason being the fact that they have been based, in one way or another, on peacetime production levels.

Down to Cases

As an example, a plan supporter cited Norfolk Shipyard, where seven 36-in Bullard VTL's, costing over $90,000, could be replaced by two new 50-hp Bullards, costing $14,000. Total productive savings would be something like $80,000. On the negative side, arguers against such a plan questioned the assumption that new machines could replace old on the basis of 34 to 117 (for Bullards) to handle all cases or all jobs.

Specific recommendations were:

1. Centralize administration of replacement.
2. Establish procedure for informing management of replacement opportunities.
3. Review all equipment periodically in the light of possible replacement.
4. Keep adequate cost records for comparisons.
5. Hold post-audits of replacements to check concrete results against original expectations.

Figures are now being prepared for Navy budget office to show costs of such a plan. One comment from a meeting attendant: Navy is reluctant to approve plan based on "factors and formulas"; it is doubtful if a plan will get going in fiscal'57.

Award for *American Machinist* Editorials . . .

was presented to Burnham Finney (left) by Ivan Given, pres, National Conference of business Paper Editors, at recent meeting of Associated Business Publications at Hot Springs, Va. Looking on is Harold E Green, chairman of the ABP awards committee. Winner of the Jesse H Neal Achievement Award for the best series of editorials published last year, were these editorials on the relationship of automation, labor, and the standard of living: "Better think it over, Mr Reuther!", "Co-determination," and "Automation—No Frankenstein" (*AM*—Dec 6, '54, p127; Dec 20, '54, p87; Jan 3, '55, p95).

Lockheed to Build C-130's On Fixed-Price Contract

MARIETTA, GA—The Air Force's first fixed-price incentive contract went to Lockheed Aircraft Corp for Hercules turbo-prop medium combat transports. This is the third contract for C-130's Lockheed has signed; but it includes the fixed price of over $97,000,000. One advantage is that it eliminates much bookkeeping and auditing.

CANADIAN TRADE FAIR:

Czechoslovakia Fronts for Iron Curtain, US Bit Small

60 Canadian exhibitors, some from Europe, Japan, hold meet for over a week. Materials handling, machine tools, small tools included in long list of categories

TORONTO—First Iron-Curtain representation since 1950 at the Canadian International Trade Fair, April 30-May 10, included a wide range of machine tools sent by 12 large Czech export-import companies, and handled by Canadian representatives. The total show was good-sized—210,000 sq ft, or about half the size of the coming Chicago machine-tool exhibit. About 33,000 sq ft was for machine tools, and more space showed off hand and portable tools.

The Czech exhibit included lathes, grinders, polishing machines, saws, shapers, portable tools, and other equipment. German lines were even more extensive, reflecting business done as a result of the last two fairs. French, Belgian, Italian, Swedish, and other exhibits showed few radically new developments; but Somua (French) demonstrated a brand-new miller available as a horizontal or vertical model, and new welders were shown by Canadian and French builders.

One drawback was the lack of a British exhibit as such. Canadian representatives showed British and US equipment; but British builders were holding back any late developments for the Olympia (London) show next year. Canadian exhibits took up at least a third of the industrial portion of the fair; the US division was 5th place in size, below Czechoslovokia, Germany, and Britain.

Highlights

Canadian Patents & Development Ltd displayed a number of recent inventions available for licensing. A new fair division was welding and metals, including a French bench welder and a Canadian spotwelder. Mopco (French) showed a new precision hydraulic-controlled grinder with automatic feed and traverse; mechanical vertical motion. Hydraulic presses were shown by Swedish companies, and Belgian firms demonstrated automatic lathes with hydraulic screw-cutting attachments. Austrian companies showed milling cutters, milling machines, and quick-change drill chucks.

One Canadian exhibitor showed a lathe with the operating apron handwheel changed to the left side. US displays included small tools and precision instruments, dial indicators, precision flat stock, hack saws.

KANSAS CITY HOST TO AWS

Show and sessions of American Welding Society feature practical welding clinic, welding's aid to automation, and welding of plastics

KANSAS CITY, MO — About 10,000 visitors saw the AWS National Spring Meeting and its 36th Annual Meeting here, June 7-10, with the exhibits being shown the last three days. Technical papers covered such subjects as flash welding molybdenum, titanium spotwelding, characteristics of welds in many kinds of alloys, quench-aging, iron-powder-coated electrodes, and inert-gas and shielded welding techniques.

Among products announced and demonstrated were a Dockson combination outfit for welding, cutting, heating, and brazing (composed of standard units); a Metal & Thermit Corp system for welding chrome-moly steels; a low-hydrogen hard-facing alloy by Wall Colmonoy; an Air Reduction #48 Duograph shape cutter with four torches, and a Velocity Power Tool acetylene torch with trigger action.

The meet was the first non-single-industry exposition held at Kansas City, and counted roughly 2000 pieces of equipment on display.

Carboloy Sets Up 1000-lb Vacuum Melting Furnace

DETROIT—New, better, and cheaper alloys to the tune of 120,000 lb per month are the aim of General Electric's Carboloy Div in starting up a new vacuum-atmosphere pilot production furnace. Most important advantage of the furnace will be the creation of alloys from lower-cost, less-critical elements than can be alloyed in air-atmosphere furnaces.

Gas turbines, aircraft parts, and possibly automotive turbines should benefit from the new equipment. Both titanium and zirconium can be alloyed into useful metals much easier with vacuum than with open-hearth or electric furnaces.

Three lines of development are foreseen because of the vacuum technique:

- Fewer inclusions of unwanted materials; therefore, closer composition control over alloys.
- Less critical-element loss, due normally to oxidation or side reactions unavoidable in natural-atmosphere melting.
- New families of alloys, impossible with older melting methods; and new purity and improvements in older alloys that almost make the new melts new materials.

Nickel and cobalt alloys gain fatigue and stress-rupture strength and ductility and workability. High-chrome alloys, when vacuum melted, are produced at lower transition temperatures, and have more impact strength, as a result, at normal temperatures. Copper and nickel gain through the lack of dissolved gases; and iron is improved in tensile and yield strength. Main point is purity in the melt, which can be applied to tool and die steels, bearing materials, and almost any alloy whose use will be benefited by better control of elements.

News of Metalworking . . .

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Gear Makers Meet at Hot Springs, Va

HOT SPRINGS, VA—Some 350 men and their wives attended the 39th Annual Meeting, American Gear Manufacturers Assn, here June 5-8. In addition to a great number of committee meetings, the program included three papers on gearing subjects. One, entitled "Gearing Gobbledygook," by Louis D Martin, Eastman Kodak Co, illustrated many of the incorrect specifications currently being put on gear drawings, and suggested methods for avoiding misleading or incorrect specifications.

Fred Bohle, manager, Machine Tool Development Dept, and Oliver Saari, development engineer, Illinois Tool Works, collaborated on the paper describing the spiroid gear as developed by their company. This is a new type of skew-axis gear which places gear axes midway between those for spiral-bevel and worm. The pinion is, in effect, a truncated cone with flat-top teeth. Advantages claimed are that many more teeth are in simultaneous contact, thus offering outstanding weight and space economies in trains or reducers. Assembly and mounting problems are simple, and the gears look complicated but are easy to produce on standard equipment. The gear type is claimed to work better than worms on many types of application. The third paper recapitulated derivation of surface-durability rating standards for various types of gears, and was presented by Walter P Schmitter, vp and chief engineer, Falk Corp.

Awards Presented

C R Burrell, vp, Tool Steel Gear Pinion Co, received an award for meritorious service in recognition of his 15 months service with the government in Washington. No Connell award was made this year.

Average monthly billings of member companies have reversed their downward trend of 1954; the first four months of this year showing

. . . and Members of the Executive

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Indianapolis

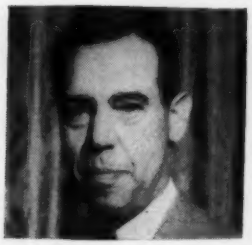
a 7% gain over last year. It was also announced that the special committee on educational work is sponsoring courses on gearing at various colleges. The first was a 16-week course last year at the Illinois Institute of Technology and one is currently going on at Columbia.

During the year, 125 standards and data sheets were processed by various committees. Ten are newly printed and thirteen are ready for printing. Among standards in process of modification are 150.01 and 152.01 on application and inspection of gearmotors and shaft-mounted reducers. Number 255.01 on bolting, 260.01 on shafting, and 265.01 on bearings have been reapproved. Data sheet 462.01 on gearmotor ratings is being studied to see whether or not it should be kept, and 463.01 on standard gearmotor brakes has been sent to NEMA for comment. 421.03 on high-speed gear reducers (and the accompanying data sheet) is ready for member vote. Durability ratings have been increased one third in helical and herringbone standard 430.02. 151.01 on application and classification of speed reducers is ready for final approval, and 271.01 on standard ratios for helical and herringbone reducers is being studied. The inspection committee has completed work on 234.01, tolerances, inspection and recommended backlash for worms and worm gears, 231.02 for spur and helical gears, 232.02 for bevel and hypoid gears, and 231.51 on pin measurement tables for involute spur gears. A standard for master gears is under development, and one on airframe gearing is being studied.

Committee

D W Diefendorf
President
Diefendorf Gear Corp
Syracuse, N Y

President
Benjamin Weiss



1st Vice President
R Douglas Williams

2nd Vice President
Robert W Rice

Machinery Dealers Elect Officers; Hear Government Tool Policy

CINCINNATI, O—Surplus government machine tools were a main subject of the luncheon meeting of the Machinery Dealers' National Association annual convention here, May 25. Guest speaker was John Williams of the Department of Defense, who conducted a question-and-answer session.

Dealers who have been disappointed at the withdrawal of machines opened to bidding at auctions were told that a proposed policy would limit withdrawals, and provide complete machine screening before any are released for public sale. Mr Williams commended the dealers for cooperation in the department's inspection of machines, which has inventoried 262,700 units with an acquistion cost of over $500 per item. A suggestion was made, and approved, to form a dealer commitee to work with the Defense Department in starting a program on machine-rebuilding standards.

On the question of resale of machines donated to non-profit organizations, Mr Williams said no cases of abuse had been tracked down. He noted that War Assets donations are free and clear, while military-department donations can be recalled; any machines involved in sales are believed to be War Assets units.

On the question of leasing government equipment for non-defense production, Mr Williams said that few such cases had been approved, though the possibility is intended to allow keeping complete packages at non-defense points, under ODM order VII-4. Defense Department approval is required first, then ODM rules on possible use of equipment for non-defense production.

Mr Williams noted that commercial letters of credit for dealers have been approved by GSA, and their implementation by agencies owning the machines concerned should be completed soon.

R K Vinson, executive director of the association, stated that attendance was excellent, and that dealer business seems to be improving generally.

Officers elected at the convention were; President: Benjamin Weiss, Machinery Liquidating Co; 1st Vice President: R Douglas Williams, Williams Machinery Co; 2nd Vice President: Robert W Rice, Robert W Rice & Co., Treasurer; Austin D Lucas, Austin D Lucas & Co; Executive Director: R K Vinson, MDNA National Office.

"Down-Under" Has First M/T Show

SYDNEY, AUSTRALIA—The Royal Agricultural Showgrounds here will house about 300 machine tools, July 4-9, when the Sydney Machine Tool Exhibition holds forth. Space is cramped, because the idea (originally promoted by the Chamber of Commerce) grew like Topsy, and the major hindrance is that all Showground Halls except the one being used are packed with wool. Next show may well be much larger.

Exhibitors are mainly Sydney firms, showing British, Continental, and some American products. Visitors expected will include a number of British representatives, someone from DeVlieg Machine Co, Detroit, and a buying team from Pakistan among others.

☆ Field Report USA:

LESS COMPETITION FOR INDUSTRY:

Government Closes Unnecessary Metalworking Shops

As a result of Hoover studies and findings, officialdom's competition with private business is expected to be cut down. Facilities that provide services commercially available have been closed; more to go later, barring legislation gimmicks

WASHINGTON—At least 28 shops operated by the military services have been shut down in recent months or are scheduled to halt operations shortly. These are among dozens of military-owned industrial or commercial facilities that have been shut down lately as part of the administration's drive to get the Defense Department out of competition with private business.

The Hoover Commission reported last month that the department operates about 2500 commercial or industrial facilities, and that about 1000 "could be eliminated without injury to our national defense or any essential governmental function." No estimate was given on the number of metalworking shops, but the amount is believed to be considerable.

Included among those shut down: Chain manufacturing facilities at the Boston Naval Shipyard; 10 automotive repair shops, mostly at naval hospitals; and 17 office-equipment repair shops, located at naval air stations, hospitals, and shipyards, and in other military installations.

The Navy recently issued a policy directive stating that office-equipment repair shops cannot be operated "when services required for the overhaul, repair, and maintenance of such equipment may be procured from privately owned and operated commercial facilities."

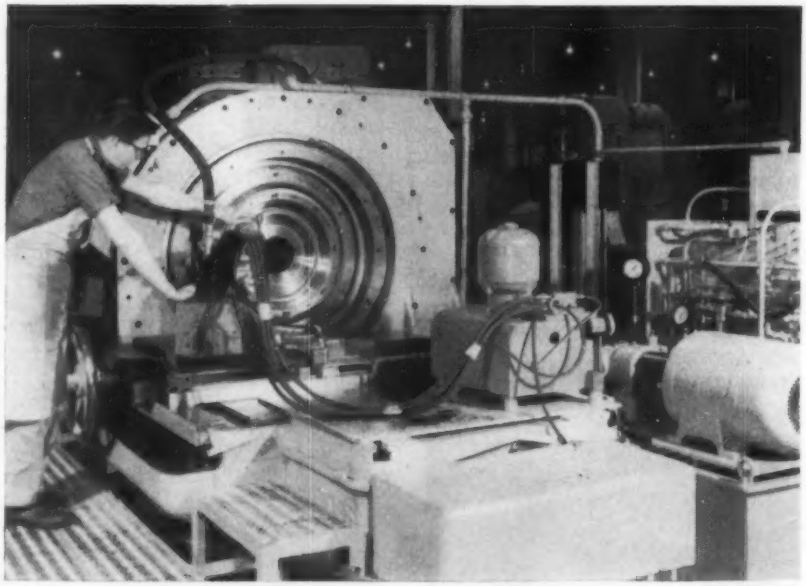
This may be the start of a trend in using private firms to service military-owned equipment—even equipment without civilian applications. For example: The Air Force recently awarded the first private contract for the overhaul of jet engines to Southwest Air Motive, Dallas, Tex. Air Force says, "This is consistent with Air Force policy of encouraging industry participation in contract maintenance."

Up to now, however, only engine manufacturers have been used for jet-overhaul work when done privately. The new contract involves maintenance and overhaul of the J-33 engine—one of the earliest production engines and a relatively simple model.

The overhaul contractor will provide most of the tooling—at a cost of about $1-million. Some special tools will be transferred to him this summer. As the contractor's "production capability increases," says the Air Force, all J-33 overhaul will be taken out of Olmsted Air Force Base, Middletown, Penna, to make way for newer jet-engine models.

If the private overhaul contract proves successful, the use of commercial overhaul facilities for military aircraft may take on major proportions.

Meanwhile, the drive to get the government out of business may get bogged down by a rider to the military-appropriations bill voted by the House. This provides for specific Congressional approval before any commercial or industrial facility run by a military service is shut down. There's another side of the coin on this issue: While some Congressmen agitate to get the government out of competition with business firms in their districts, others fear that shutdown of government-owned shops in their areas will mean loss of work or business for constituents there.

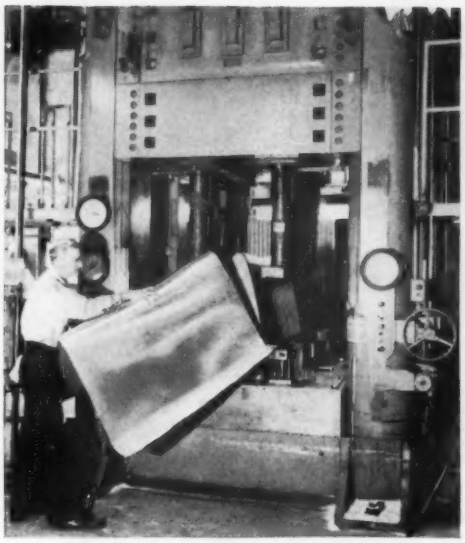


Converted Lathe Turns Both Sides Of a J-57 Compressor Disk at Once

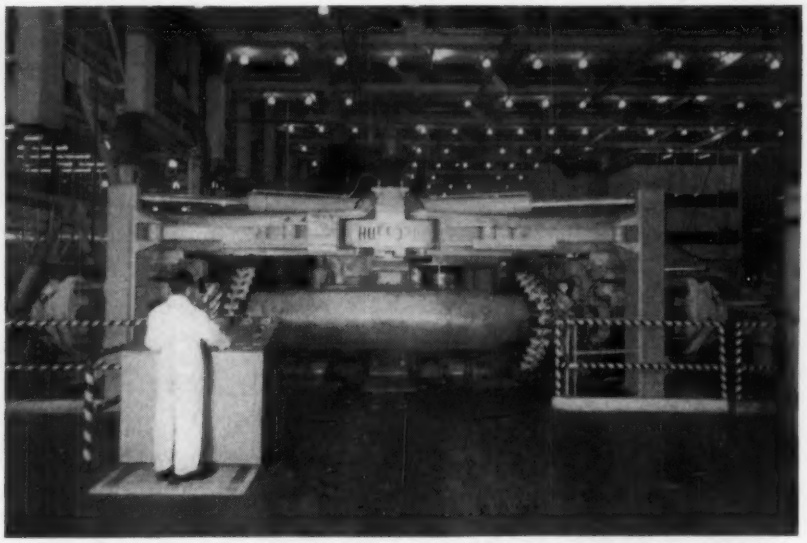
FORD TOOK AN OLD LATHE, an obsolete Wickes center drive, and converted it to lick the tough problem of machining both sides of a compressor disk at once. The job is especially tough because the stainless steel workpiece is only ⅛-in. wide at one point, and the disks have a tendency to dish if too much tool pressure is applied with ordinary T lathes, and each disk must be turned at least six times during finish contouring. Ford's Aircraft Engine Division licked it by stripping the old Wickes lathe to its base, keeping only the center drive, and adding new ways and carriages, a hydraulic tracer, and new feeds, spindles, speeds, tooling, and coolants. The result: tools work opposite each other at all times, dish is eliminated, setup time is cut 75%, output has doubled, quality is improved, scrap loss is negligible

Field Report, USA:

☆ Field Report USA:



SAN DIEGO: dorsal-fin leading edge is formed over narrow plastic dies from 0.032 gage 2024T aluminum alloy in two operations on this press at Convair — 7% in the first draw



EL SEGUNDO, CALIF: Douglas Aircraft Co. is stretch-forming commercially pure titanium sheet 0.080 x 48 x 177 in. on this huge stretch press at room temperature. The sheets, costing about $2000 each, are said to be the largest ever formed by this process. They're slated for use on nacelles of DC-7's, first commercial airliners to use titanium extensively.

East Coast...

New wrinkles . . .

KENILWORTH, N J—John Berry is a man who likes new ideas. And when he finds one he likes to pass it along to his friends, neighbors and customers. As head of a local steel warehousing firm, Kenilworth Steel Co, he gets around to a lot of tool shows and industrial shows of one kind or another—and he sees a lot of new wrinkles.

Last year he conceived the idea of inviting firms who had shown such items elsewhere to exhibit them in his big steel warehouse. In that way, everybody would benefit. The exhibitor would get free show space and publicity. The public would get a chance to see what's new in industry. And Kenilworth Steel would get a chance to show its friends and neighbors how a steel warehouse operates (exhibits were to be sandwiched between stockpiles and such operations as slitting and rolling).

It worked. Exhibitors piled in with some pretty spectacular displays. And the public piled in, too. This year, most of the exhibitors were back for the second week-long New Ideas Clinic with more new wrinkles, and a lot of new ones got into the act, too.

While the clinic isn't confined to metalworking displays, that's what gets the lion's share of attention. This is a sampling of attention-getters at this year's Clinic: Raytheon Mfg Co demonstrated ultrasonic drilling; DuMont TV showed industrial applications of closed-circuit television—and one of its distributors had a radio communications system hooked up with some new propane-powered Yale & Towne fork trucks running around the warehouse and ground; Air Reduction Co demonstrated the latest welding techniques; a neighboring firm, Adams Stamping Co of nearby Union, N J, set up and operated an 8-station transfer unit that does three drilling and five tapping jobs simultaneously, occasioning a few "it'll never get off the ground" comments from the uninitiated.

The something-for-nothing departments got a big play, too: U S Tool Co stamped out vinyl-coated metal money clips and gave them away. And John Berry had a Pennsylvania R R dining car run right into the plant to serve free buffet luncheons and suppers, with interim coffee-breaks, to upwards of 8000.

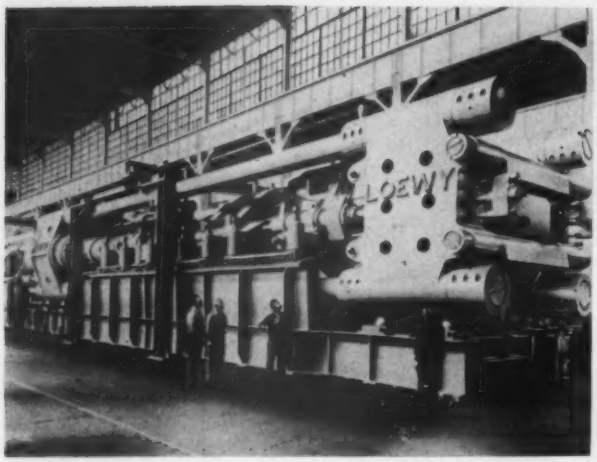
New toolmakers for Philly . . .

PHILADELPHIA—First apprentices trained under the Philadelphia Tool & Die Manufacturers Association, 20 in all, received their journeymen's certificates at a dinner in the Barclay Hotel May 23. Apprenticeship notables in evidence included W. F. Patterson, director of the U S Bureau of Apprenticeship; Joseph D Dolan, Pennsylvania apprenticeship supervisor; and Jack Kleinoder, Chairman of NTDMA's Apprenticeship Committee.

Eastern briefs . . .

Avco Mfg Co's Lycoming Division, Williamsport, Pa, has a contract from the Army for $2.5 million for tank engines, will hire some 200 workers for the project . . . Philadelphia attorney Albert W Gilmer has been named to head the Philadelphia Ordnance District. He will serve without pay . . . Board Chairman Willard F Rockwell of Rockwell Mfg Co, Pittsburgh, says what the government needs is more engineers in Congress to overcome "lack of a sound engineering approach in the conduct of government in business" . . . Commercial Products of Baltimore has come up with the Conelradio, a radio that works like a regular table model, but which honks loudly anytime an enemy plane is spotted in your area . . . GE's Schnectady, N Y, Research Labs have come up with a new method of mounting diamonds in diamond tools that saves up to 90% of diamond cost. It's this: A considerably smaller diamond is mounted in a smaller cavity, using titanium hydride as a wetting agent and silver-copper as solder.

Field Report USA:



ROCHESTER, N Y: this 8000-ton extrusion press, designed and built by Loewy-Hydropress, is shop-erected at Consolidated Machine Tool Corp, prior to disassembly and shipment on 40 flat cars to Harvey Aluminum, Torrance, Calif, division of Harvey Machine Co

SCHENECTADY: GE says it's developed a method of making a tracing in a few minutes, where it took 6 to 18 hr to do with ordinary methods. GE's technique involves new uses of the photo-mechanical process, makes sharper prints on positives that are tougher than tracing paper

Southwest...

Tool and dies booming ...

SAN FRANCISCO — Job shops in the San Francisco Bay area are reported prosperous, in as "healthy" a condition as they've been since World War II. Subcontract work is being sub-subcontracted by small shops if working at capacity, or to shops that have better facilities for certain operations. Even semi-skilled labor is hard to find.

One stamping shop, for instance, is working three shifts now (65 men total) compared to two shifts a year ago, and farms out a good quantity of work. While ¾ of its work presently is for the automotive industry, which is buying an increasing number and variety of parts for western assembly plants, the owner does not tie his prosperity to the high volume of automobile production. He feels industry in the area generally is producing at a rate that would use up his capacity.

Spotty—but not bad

LOS ANGELES—General prosperity in Southern California manufacturing has reflected onto small job machining shops. One owner says, "Last year we were out beating the bushes; now they're coming to us." Another says he's had no trouble since the first of the year, and that he's increased personnel 30%.

Still, small shops are having their troubles, even though mainly busy, because of small backlogs. Larger plants with steady customers are in a good position. But plants that normally farm out orders are keeping these small; and most are on a rush basis.

Manufacturers here let out orders only when their own shops are in a bind, leaving jobbing shops on an unsteady basis.

Competition is keen in both cost and quality, and margins of profit are definitely down. Manufacturers are choosey, demanding detailed cost quotations even for small jobs.

Electronics and Aircraft

Most small shops in good shape have used diversification effectively; aircraft is still a mainstay, but no longer a bonanza. Electronics is the second most important industry. But shops that got used to having a few fat aircraft contracts have had to change their ways: One plant that used to have two or three accounts now has 25. Some shops have developed their own proprietary items as mainstays.

One sign that things have, nevertheless, picked up in the last six months is a shortage of skilled help —long a chronic problem, but now acute.

Some plants have turned down jobs because of lack of journeymen jobbing machinists, turret and engine-lathe operators, and some other skilled classifications. Says one official, "This year should end up as well as '52 and '53, if we can get the people." Small companies complain of the wage competition of the big aircraft companies.

A new trend: Because aircraft orders are a smaller proportion of their workloads, job shops are less worried than before about the threat from Washington to stop further aircraft-industry expansion in this area—although they *are* somewhat concerned. Opinion is that any major policy shift will be quickly felt by local industry.

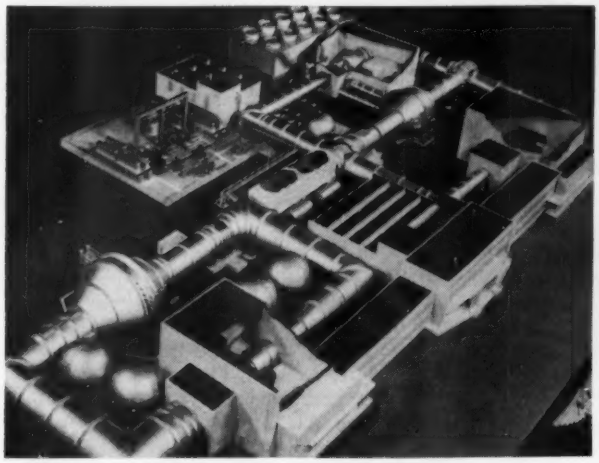
Detroit...

... und (almost) too late schmart

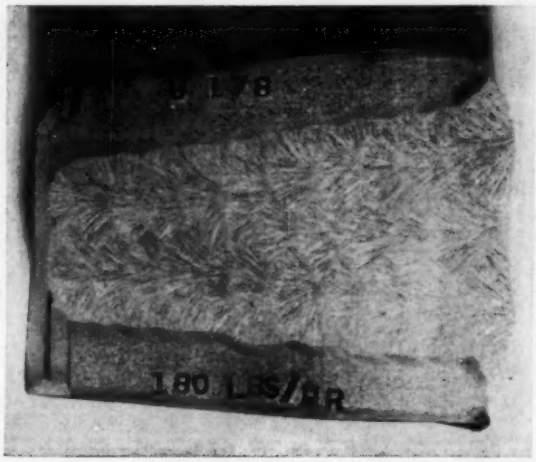
DETROIT — Vassar is a town of 2,700 souls, located north of Flint, Mich. It's almost totally dependent upon the $2.9-million annual payroll of Eaton Manufacturing Company's gray iron foundry, which employs upward of 600 workers.

Vassar was, therefore, shocked in late May by Eaton's announcement that it planned to shut down the foundry on June 30. Among the reasons given for Eaton's action, as explained by Frank Mott, company administrative vice president: An average hourly pay rate of $2.67, compared to a prevailing rate of $2.05 for similar work in the area. Mott indicated that the high labor cost ran the price of the Vassar plant's products up so high that it could not compete with other firms

Field Report USA:



MOFFETT FIELD, CALIF: first electronic brain to be installed in the San Francisco Bay Area, this Datatron digital computer will compute data developed on the 8-ft Ames Unitary Plan Wind Tunnel in tests of aircraft and guided missile scale models of designs slated for 3000 mph



ALLIANCE, OHIO: this is a cross-section of a welded butt joint in a 3-in. thick SA-212 steel plate, deposited at a rate of 180 lb per hr with a new method developed by Babcock & Wilcox. Normal production rates for this type of automatic weld deposition are 17-20 lb per arc hr

and had suffered a 40% sales drop.

Local 564 of the AFL United Auto Workers' Union, according to company spokesmen, was notified last October that the company was in trouble and that union suggestions were solicited, but none were proposed. The union, however, immediately after Eaton's announcement that it would shut down June 30 when the 5-year union contract expires, offered to negotiate "the situation."

Latest Eaton development—over 90% of union membership has signed petition agreeing to wage cut (presumably about 62¢ to equal going local rate). Foundry will be kept open. Normal two-week July plant vacation will allow time to negotiate a new contract—temporary for 2-3 months, and permanent if it works out.

Cleveland...

Three Steady Workers

CLEVELAND — Here are the experiences of three small machine shops in this area:

Company A employs 40 men, and specializes in building unique machines for Blue Chip firms. To balance that line, it takes in jobbing machine work, but no subcontracting, mainly to keep idle machines busy. Not a job is taken unless bid for. The system has worked well; since the first of the year, the shop has been busy, and now there's a backlog that will last 'til November.

Last year, 40 hrs was the standard week; now it's 52 hrs. With a specially trained, skilled working force, the company doesn't shift the payrolls when orders demand, but piles on extra hours, or cuts hours, depending on work available. Last year was fairly good, financially, and this year promises to be one of the best.

Company B was in the same 40-hr spot a year ago, and now runs 44 hrs. per week. But B's business is entirely different, because it is one of the few that mixes machining and fabricating. They believe this gives them an advantage, for if another company might beat them on price for a machining job, B should still get it because of fabricating ability. Like A, Company B got sick of subcontracting and ending up with merely material, experience, wear and tear on machines, and only a bare living.

B is not experiencing the peaks and valleys of automative and appliance manufacture. Although there is no backlog to speak of, there is an accumulation of orders on the basis: "We have a job for you to do when you can get around to it in the next two or three months." Business has picked up remarkably in the last nine months, and prospects for this year are even better. They've had no trouble with scarce steel—in fact, the Vice President has had to fight warehouse and mill salesmen away, and can get any kind of steel in nearly any quantity on a 30-to-60-day delivery.

Company C is another veteran machine shop with skilled working force and up-to-date equipment. Right now the payroll is down 2/3 from a year ago, but there's been a pickup in the last two months and prospects in the next month or two look better. C staked its future on aviation parts during the war, and more or less turned its back on old customers. But these are the source of good prospective business for the future. The company was down to bed rock about three months ago, and decided to go after its old customers. Orders have started trickling in. Question: Should C drop defense work entirely?

Steel warehouses are working about 20% ahead of '54, at about the rate of banner year '53. Nickel shortages have developed into what some warehouse managers call "informal allocation" of nickel-bearing alloys. It means hand-to-mouth operations. Flat rolled coils are the only other steel form not readily available; but Detroit is evidently getting it, because there is plenty of sheet cut to specific size.

Cleveland's unemployment compensations have declined steadily for three months, and are down to half last January's level. This indicates that labor has picked up two thirds of the way from the low employment spot in 1954.

Field Report USA:

Southeast...

Wages May Climb

ATLANTA—Talk of increasing the minimum wage has Southern metalworking management (as well as other manufacturers) on edge. Reason is that of an estimated 817,000 factory workers in the US earning less than $.90 per hr, nearly 520,000 of them are located below the Mason-Dixon line. That's more than 20% of the entire work force in the South. Any sweeping changes in the law would cost millions of dollars in wages to Southern manufacturers and probably result in a general across-the-board increase in the entire wage structure for the area. Right now, production workers in Dixie's assembly plants and metalworking shops are averaging a $1.36 per hr, as compared to $1.67 in the Northeast and $1.80 in the Mid West. Any change isn't likely to put a stop to industrial expansion though. The overall trend in the general wage picture in the South is currently upwards, as the available labor pool is drying up.

Latest available figures show very few labor-surplus spots in the South. Take Georgia for example: Last week there were about 23,000 nonfarm workers drawing unemployment compensation checks. Of that figure, some 3000 were on some sort of part-time work. Compared to the persons covered by the unemployment compensation act (some 600,000 all told) this results in a level of unemployment in the state of a shade under 4%. That is close to half of what it was a year ago. By midsummer, many areas in Georgia—particularly Atlanta—may be faced with labor shortages.

GAW has little effect on the current industrial picture in the South. Sure, it's a factor in the auto assembly plants and in industries affected by cyclical changes, but it's of little concern right now in plants that have big backlogs and are going full blast.

Take Lockheed Aircraft: They have added another 2000 workers to their rolls since the first of the year, bringing total employment at the Marietta plant to more than 17,000. Rather than move into overtime, the company is sticking to a 40-hr week and is scheduling work to level out the peaks and valleys in employment throughout the year. Result is full employment on a twelve-months basis. A number of other companies are following suit.

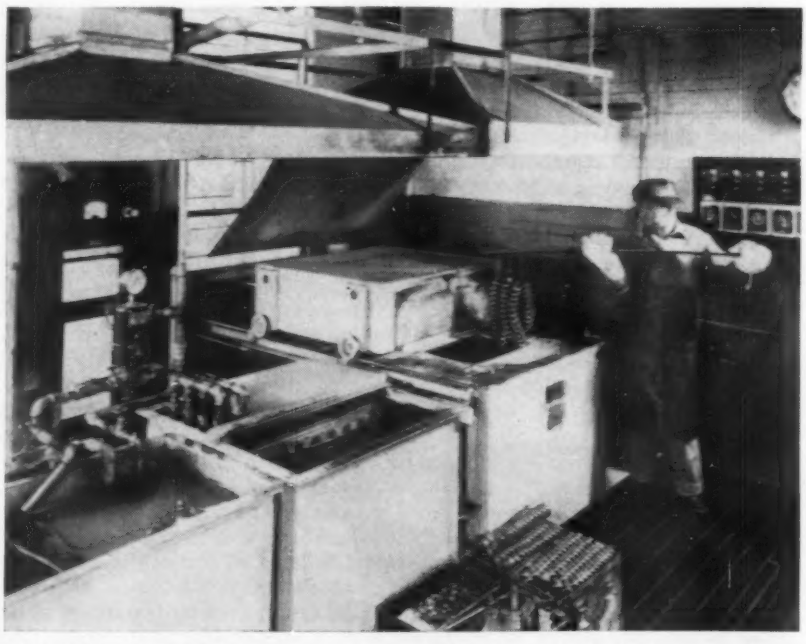
Suppliers on Punched Cards

Lockheed is also looking to the development of more small businesses and local industry throughout Georgia—particularly metalworking. The company is embarked on a survey of small shops and plants within a 300-mi radius, evaluating each shop or plant as a potential supplier or subcontractor. Results will be tabulated and placed on IBM punched cards with the firm size, facilities, experience, technical ability, and other qualifications acceptable for aircraft work. When completed, the information will go to Lockheed's purchasing people who will use it in locating nearby sources for subcontract work.

For example—the company may want to subcontract a sheet-metal assembly for the C-130 Heles transport which could be manufactured only by companies having a Hydropress or drop hammer and heat-treating facilities. The buyer sets the requirements on IBM cards and comes up with the nearby firms that have the ability to do the work. They are then invited to bid.

Lockheed's not doing it simply to stimulate local industry—though that plays a part, too. Reason is that a number of other aircraft companies are eyeing the South as a potentially rich field for aircraft manufacturing. Fairchild has new facilities in St Augustine, Florida, Douglas is opening a guided missile plant in Charlotte, NC, and Hayes Aircraft is expanding in Birmingham, Alabama—to mention a few. So Lockheed wants to make sure it won't be squeezed out of the market as the industry expands in the area.

The keel for the largest ship ever built on the gulf coast was laid at the Ingalls yard at Pascagoula, Miss, on May 16. It will be a 25,000-ton supertanker for the US Maritime Administration, and will carry 190,000 barrels of oil, have a speed of 18 knots at 80% of rated 18,600 shaft hp. Launching is set for February.



DAYTON: this salt bath furnace, purchased originally to do just one operation, is performing four separate functions for G H Leland Co's heat-treating department — carburizing, brazing, simultaneous brazing and case hardening, and hardening. The small 65-kw Ajax Shopsmith processes more than 500 different punchings, stampings and machined parts for electronics equipment. And it (1) has eliminated three material-handling operations and cut unit costs 80% by performing simultaneous brazing and carburizing, (2) has performed a brazing operation that cut unit costs from $14.20 to $9.10 per 1000 parts, and (3) has hardened low-carbon, cold-rolled steel parts

Western Electric's Winston-Salem plant . . .

built to make communications devices for Bell Telephone and the Armed Forces, has 625,000 sq ft of floor space on a 62-acre site. Right foreground are the offices: behind them is a 760 x 360-ft manufacturing building. They're connected by a 12-ft-wide covered passageway

. . . has a completely enclosed toolroom

on the perimeter of the main manufacturing floor. This building also houses shipping and storage areas, press shop, sheet metal shop, inspection areas, cafeteria and other employee facilities, and an engineering lab

Companies in the News . . .

Leyman Mfg Corp, Cincinnati, has purchased the **Nebel Machine Tool Co,** subsidiary of Charles William Doepke Mfg Corp. Nebel will continue manufacture of lathes and other machine tools under its present name.

Ford Motor Co will construct a 580,000-sq-ft addition to the Livonia, Mich, automatic transmission plant. Expansion will up the facility's present 5000-employee population to an ultimate 8500.

Erickson Tool Co, Cleveland, has purchased **The E Westberg Corp,** East Syracuse, NY, manufacturer of Colletmandrels. Operations are being transferred to the Cleveland plant where Erickson will make the line and market it under the Westberg name.

Bellanca Aircraft Corp, New Castle, Del, has acquired **National Electronics Laboratories,** Washington, DC, manufacturer of communications, radar, and specialized aviation test equipment.

Electric Auto-Lite Co is consolidating its three Syracuse, NY, operations into a single facility. Purchase of a 213,550-sq-ft plant from **US Hoffman Machinery Corp,** plus remodeling, represents a $1-million investment, and 67% more space than Auto-Lite had in its scattered plants.

Marble Plastic Co, Franklin Park, Ill, appointed a sales-engineering representative for **Marblette Corp,** Long Island City, NY, will give assistance in plastic tooling and uses of molds in vacuum forming. Territory covers Illinois, Indiana, Kentucky, Iowa, Minnesota, and Wisconsin.

E W Bliss Co has temporarily cut operations of its Canton, Ohio, division from five to four days a week in all departments except product engineering. The division employs 1600 factory workers.

Youngstown Sheet & Tube has broken ground for a new seven-building tin mill at its Indiana Harbor Works, East Chicago, Ind. New mill, scheduled for completion in the fall of 1956, will double the plant's present tin capacity.

Chain Belt Co of Milwaukee is erecting a new factory building near Downers Grove, Ill, for its Shafer Bearing Div. Facility, containing 100,000 sq ft of floor area, will be partially completed in November, balance will be occupied next year.

Prex Forgings Inc, Chicago, is building a new plant of 87,000-sq-ft floor space, consisting of four buildings: a high-bay forge shop; large, air-conditioned tool, die, and heat-treating shop; office, engineering, and laboratory building; and a cafeteria. Facility will produce aluminum no-draft forgings for the aircraft industry, as well as dies.

Madison Manufacturing Co, Muskegon, Mich, and **Madison Industries, Inc,** Big Rapids, Mich, have been purchased by **Flightex Fabrics, Inc,** Providence, RI. Both concerns will operate as wholly owned subsidiaries and continue to manufacture Madison adjustable boring and reaming tools, gun drills, trepanning tools, borgages, and grinding fixtures.

Temco Aircraft has been awarded a subcontract to build large quantities of three separate assemblies for the North American F-100D Super Sabre. Items included are wing-tip panels, inboard and outboard ailerons, and flaps. Contract, in excess of $1 million, will be carried out at the Garland (Dallas), Texas plant.

Barrett Equipment Co, St Louis, Mo, has established an Industrial Division. Products being manufactured include: riveters; replaceable-tip carbide cutters; drum lathes; metal parts washers; bleeder tanks.

THE BULLARD CO APPOINTMENTS .. Frank U Hayes (left), a vice president and sales manager, to assistant general manager; and **H Edward Neale**, assistant sales manager, to sales manager

Robert G Emrick, executive vice president of Ettco Tool Co, Brooklyn, NY, has been elected president to succeed his brother, **Melvin H Emrick,** named chairman of the board

Names in the News . . .

Frank F Elliott, senior vice president in charge of sales of Crane Co, Chicago, has been elected president and chief executive officer to succeed **John L Holloway,** resigned, **Mark W Lowell,** vice president of Continental Illinois National Bank & Trust Co, has been named board chairman.

William J Millett, works manager at Worthington Corp's Holyoke plant, has been appointed assistant vice president in charge of manufacturing of the Air Conditioning and Refrigeration Division.

Alexander L Naylor, executive vice vice president of Fairbanks Co, NY, has been elected president. He succeeds his father, **George M Naylor,** who died in April.

Chrysler Corp appointments: **Roy Blasiola,** manager of aircraft operations at the Mound Road and Outer Drive plants, Detroit, named plant manager of the Nine Mile Press Plant; **Leo J McPharlin,** supervisor of purchases for the Automotive Body Division, appointed divisional purchasing agent; **Adrien L Richards,** assistant general superintendent of the Sheet Metal Div to general superintendent; and **Norman R Reno,** master mechanic of the Marine Industrial Engine Div, named works manager.

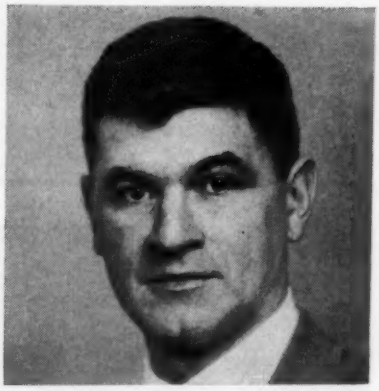
Paul R Holmes, manager of Rheem Mfg Co's Washington, DC, office, has been appointed manager of the company's Downey, Calif, plant. He succeeds **W R Miller,** who has resigned.

Torrington Co promotions: **Lawrence W Smith,** assistant vice president of manufacturing, to vice president, manufacturing; **Byron T Virtue,** chief engineer, Bearings Division, to vice president, engineering; **Edward B Thompson,** Bearings Div sales manager, to vice president, sales; **William R Reid, Jr,** Needle Div sales manager, to assistant secretary and general sales manager; **Floyd A Pearce,** treasurer, named in addition, vice president, finance; **Walter Hudson** to assistant treasurer; and **Ray E White,** named controller.

Clyde B Faverty has been appointed director of manufacturing for Pullman-Standard Car Mfg Co, Chicago. He has been acting director since last September when he succeeded **Norman B Johnson,** vice president. Mr Johnson, who served as special consultant and vice president since that time, retired June 1.

CHRYSLER CORP APPOINTMENTS .. John E Brennan (left), general manager of the Automotive Body Division, named manager of the Nine Mile Press Plant, the twelfth to be included in the division which Mr Brennan heads; and **Stanley Kinney,** general superintendent of the Sheet Metal Division, appointed works manager of the body and car division of Chrysler Division. (Additional appointments listed above)

Milton E Berglund, vice president of manufacturing of the Torrington Co, Torrington, Conn, has been elected executive vice president. (For other appointments, see above)



HARTFORD SPECIAL MACHINERY CO PROMOTIONS .. **L K Shepard** (left), formerly sales manager for the Drill Unit Division of Rockwell Mfg Co, Pittsburgh, whose line of air-hydraulic drill units was recently acquired by Hartford, named sales manager of HSM's Machine Tool Division; **Harvey L Spaunburg, Jr,** appointed sales manager of the General Contract Division; and **Arnold T Suhart** to manage sales of the Machine Tool Accessory Division

Ford Motor Co engineering staff realignments: **Harold C MacDonald,** chief advanced vehicles engineer, to director of the Mercury car engineering office; **J J Felts** named his executive engineer; **Harley F Copp,** chief product engineer for the Continental Division, to director of the Lincoln car engineering office, with **P H Kuhn** as executive engineer; **Neil L Blume,** executive engineer in charge of Lincoln and Mercury car engineering, to director of the special products engineering office, with **B T Andren** as executive engineer. **Robert Stevenson** has been named to direct the new engine and electrical engineering office, assisted by **Paul M Clayton** and **L L Beltz** as executive engineers. **Victor G Raviolo,** formerly director of the Lincoln and Mercury engineering office, has been appointed director of the advanced product study and engineering research office.

Arthur E Darcy, abrasive belt machine specialist formerly associated with Beals, McCarthy & Rogers, Buffalo, NY, has been named manager of the machine methods department of Carborundum Co's Coated Abrasives Division.

Merle E Snyder, who assisted in forming the electronics division of Bristol Engineering Corp, Bristol, Pa, has been appointed divisional manager.

Great Lakes Stamping & Mfg Co elections: **George Pinkus,** executive vice president, to president; **B J Secor** and **A R Pass** to vice presidents; **Henry Block,** secretary, and **Howard Pinkus,** treasurer; **B Z Ranan** to general manager, manufacturing.

General Motors promotes: **Charles W Frederick,** assistant chief engineer, to director of engineering at the Detroit Diesel Engine Division; **Clyde W Truxell, Jr,** director of engineering and manufacturing for Allison Division's Aeroproducts operations, to works manager of Detroit Diesel; he replaces **A F Davis,** named director of engineering and manufacturing at Diesel Equipment Div, Grand Rapids, Mich.

Robert C Andrews, formerly special account sales representative with Vickers, Inc, has been appointed sales manager for Clark Equipment Co's Axle Division, with headquarters in Buchanan, Mich.

Conde Hamlin, executive vice president of DeWalt Inc, has been elected president of the American Machine & Foundry Co subsidiary.

Society of the Plastics Industry, Inc, elections for 1955-56: **Norman Anderson,** president of General Molded Products, Des Plaines, Ill, named president; he succeeds **John J O'Connell,** president of Consolidated Molded Products Corp, Scranton, Pa, elected chairman of SPI's board; **Allan S Cole,** executive vice president of Breskin Publications, New York, named vice president; and **William C Bird,** president, Prolon Plastics, Pro-phy-lac-tic Brush Co of Florence, Mass, elected secretary-treasurer.

Vasalie Peickii, director of research, has been elected vice president, research and engineering, for National Motor Bearing Co, Redwood City, Calif. **Milton Bulkeley,** treasurer, has been named, in addition, general manager, succeeding **A E Werolin,** resigned.

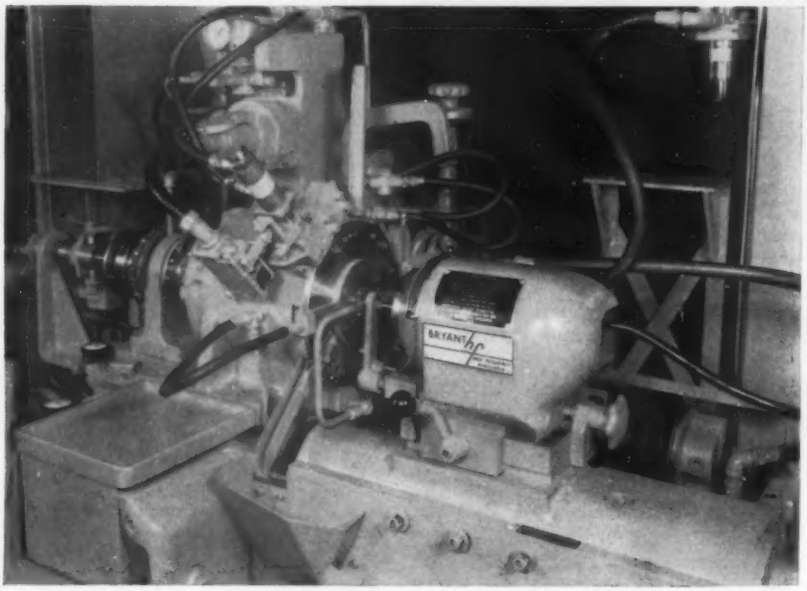
OBITUARIES

William J Kelly, 56, president of the Machinery & Allied Products Institute, died May 29 in Chicago after a long illness. Head of MAPI since 1937, Mr Kelly was largely responsible for leading the organization to its present position of achievement. He served as special consultant to the chairman of the War Production Board from 1942-44, and at the time of his death was, in addition, chairman of the Council for Technological Advancement, national spokesman for the capital goods industries, and senior partner of William Kelly & Co, Chicago management counsel.

Ray L Newton, 63, assistant general manager of Cadillac Motor Car Division, died May 17 in Highland Park, Mich.

Hall E Whitelock, 60, president of E H Whitelock Co, Cleveland manufacturer of protective metal coatings, died May 30 in Cleveland.

New Shop Equipment



Air handles both chucking and final gaging in this internal grinding setup for inner-race bores. Air gaging was done for the first time on this machine, one of 17 for New Departure Div, GMC. An air plug, with two opposed orifices, enters from the rear during final grinding, reciprocating with the wheel but about 0.010 in. away. It thus gages each pass, continuing until size is correct. Loading and unloading are automatic

The air gage panel used with Bryant automatic air sizing measures the pressure peaks occuring when the air plug is oscillated into the work part. These readings are then converted into electrical impulses Cutout occurs when dial at center indicates zero. Knob at lower left adjusts size. Light at upper left flashes when pressure switch controlling Timer operates. Zero adjustment, lower right, is used to adjust pressure switch

Continuous Air Sizing Applied to Internal Grinders

Continuous air sizing has been applied to internal grinders by Bryant Chucking Grinder Company, Springfield, Vt. Essentially, the air plug replaces the solid plug, entering the bore from the rear and reciprocating with the wheel. Not only does the air plug eliminate gage wear and "rapping" of workpiece at every stroke until the plug enters, but also it permits higher accuracies. While the solid plug could hold parts to 0.0002 or 0.0003 in., the air unit achieves 0.0001 in.

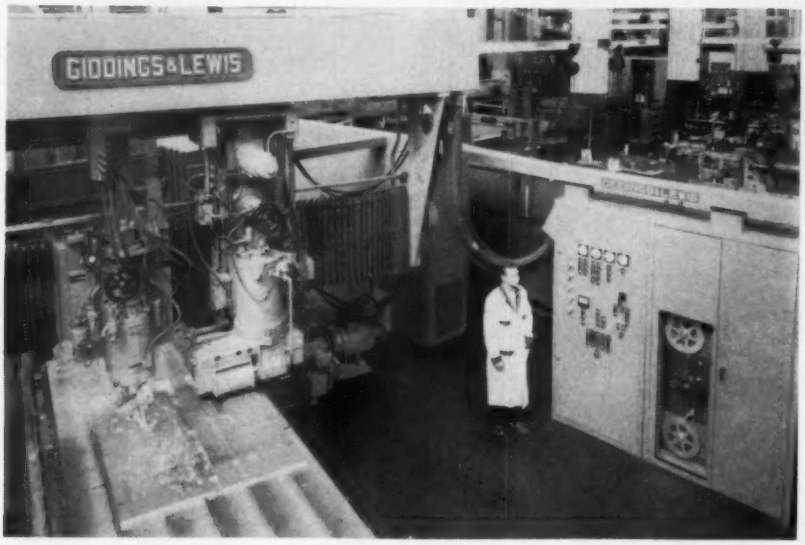
Roughing cycles are unchanged. The wheel roughs the bore to within 0.0008 or 0.001 in., with size controlled by the diamond dresser. Then the wheel is diamond dressed and the sizing plug timed and controlled from the wheel slide for the finishing cycle. The wheel is fed out by cam on smaller machines and by feedscrew in larger ones, so there is no "sparkout" cycle. Air is shut off automatically (except for bleed to clear orifices) during all the cycle except just before gaging begins (some lead time to permit gage to stabilize and prevent drift).

The gaging circuit involves two changes in air pressure and volume to actuate the gage and initiate reload cycle. A slight change in plug air pressure operates a precision relay (limit switch). This affects a second air supply of greater volume but at the same pressure. Also, a pressure switch controlling the machine timer opens and closes each time the plug enters and leaves the bore. When the bore comes to size, the switch fails to close, so no pressure peak or impulse is transferred to the timer on the slide. The wheel does not enter again, but is held in the withdrawn position while the reload cycle is initiated. A high-speed relay in the circuit keeps back pressure up when the plug is out of the hole, to reduce drop-off of the gage needle, so gage response is faster.

These machines incorporate another innovation—shoe centerless workholding fixtures with magnetic drivers. Rings are supported, and rotate, against two carbide-tipped shoes, running on the OD. A ring electromagnet (with carbide button inserts to reduce wear) forms the chuck face. It is slightly off grinding center, so its rotation not only rotates the workpiece but also holds it against the two shoes. Concentricity between OD and ID is better, and the loading cycle shorter with this system. Loading and unloading are by gravity through chutes, with interlocks to shut the machine down in case of a reversed piece, cocking, sticking in loading chutes, or other difficulty.

Bryant Chucking Grinder Company, Springfield, Vt.

Materials and Parts . . .



G&L Numericord System Automates Machine Tools From Numerical Data

Giddings & Lewis has developed the Numericord system for completely automatic control of multi-axis machine tools. The system is said to be the first commercially available set-up to combine electronic brain and magnetic memory functions. Resulting from three years of G&L-sponsored research at M.I.T. and allied research at GE, the system was recently demonstrated in the operation of a G&L aircraft-type skin milling machine (one 360° profiling 50-hp head and one rise-and-fall 100-hp right-hand head, table work area, 6x14 ft) performing all plunge, channel, pocket, and contouring cuts necessary to mill complete jet plane skin and wing panels from solid 75ST aluminum plate.

In addition to this machine, G&L is offering the Numericord control with horizontal boring, drilling, and milling machines; planer-type millers; and vertical boring mills. However, since the system can control up to five machine axes simultaneously, it finds its most effective application on variable-axis, three-dimensional contouring machines, and actually eliminates inaccuracies inherent in templet-tracer controls, as well as mounting and mechanical linkage problems.

The system provides another advantage in its complete physical separation of numerical-tape preparation and machine-control components. Tapes can be prepared on a continuous production basis for all machines and jobs in the shop. Files of magnetic tapes can be maintained.

Flexibility of the system is indicated by the number of ways in which it can be used. In addition to operating on numerically prepared tapes, the machine-control portion of the system can be used independently to produce its own tapes. One such method records machining cycles under templet control. Signals are impressed on magnetic tape by machine axes synchros as they report tool head travel. Recorded tapes can be similarly produced by having the operator put the machine through simulated machining motions in a dry run. Method can also be used when operator machines first part.

Four major components make up the Numericord system: (1) a paper

(PLEASE TURN PAGE)

. . . including

MACHINE TOOLS AND ATTACHMENTS

Double Horizontal Grinder....page 170
Internal Broaching Machine....page 176
Hydraulic Metal Saw.....page 178
Screw Machine Control.....page 178
Drilling Machine.....page 182
Honing Machine.....page 186

TOOLS AND ACCESSORIES

Boring Tool.....page 170
Machine Vises.....page 172
Rotary Table.....page 176
Drill Sharpening Kit.....page 184

FORMING AND WELDING

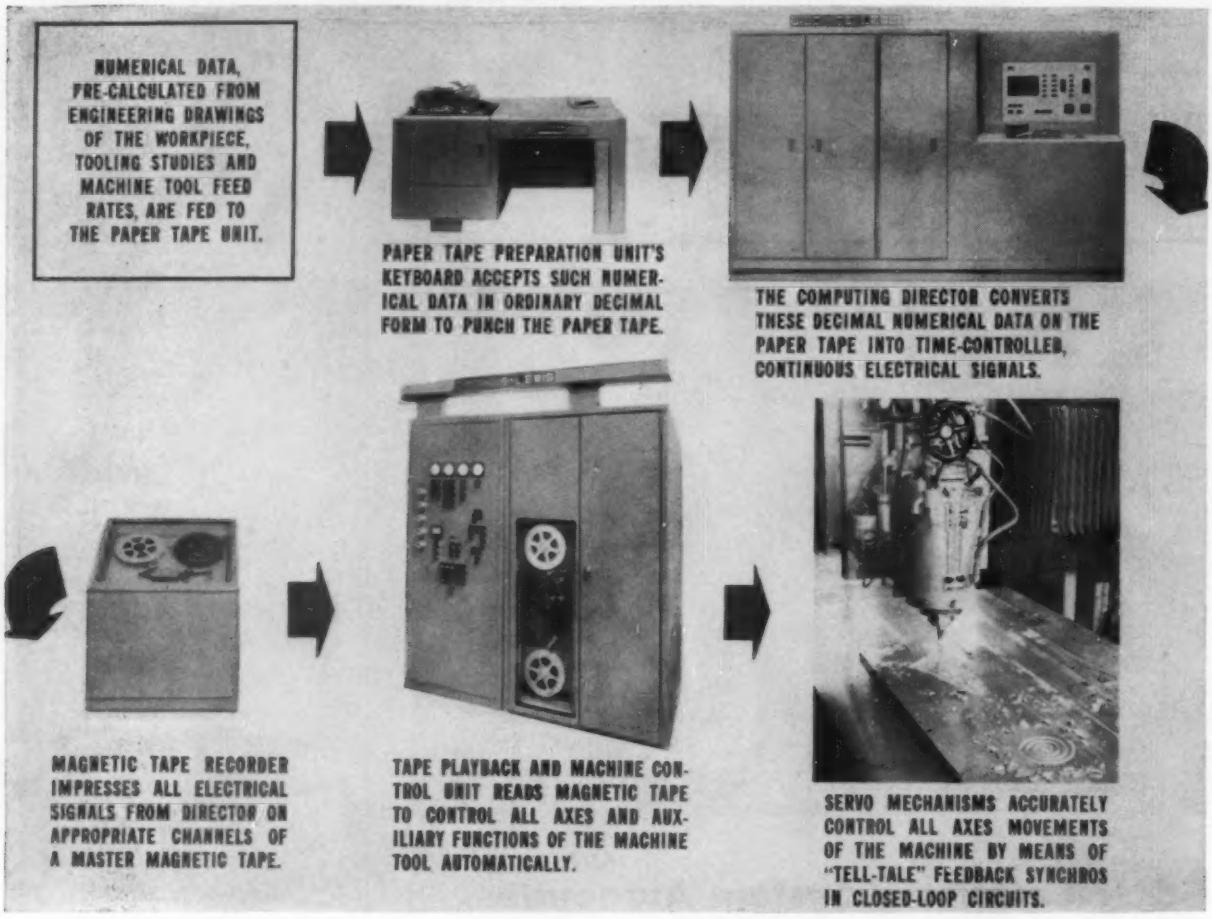
Automatic Welding Head.....page 172
Resistance Welding Machine page 174
Chrome-Plating Machine.....page 176
Welding Fixture.....page 180

FINISHING AND INSPECTION

Inspection Machine.....page 170
Fire Detection System.....page 172
Brushing Lathe.....page 180
Flaw Detection Unit.....page 184

PLANT SERVICE AND PARTS

Drum Lift.....page 172
Titanium Shear Bolts.....page 176
Ball-Bearing Unit.....page 178
Speed Control Unit.....page 184


NUMERICAL DATA, PRE-CALCULATED FROM ENGINEERING DRAWINGS OF THE WORKPIECE, TOOLING STUDIES AND MACHINE TOOL FEED RATES, ARE FED TO THE PAPER TAPE UNIT.
PAPER TAPE PREPARATION UNIT'S KEYBOARD ACCEPTS SUCH NUMERICAL DATA IN ORDINARY DECIMAL FORM TO PUNCH THE PAPER TAPE.
THE COMPUTING DIRECTOR CONVERTS THESE DECIMAL NUMERICAL DATA ON THE PAPER TAPE INTO TIME-CONTROLLED, CONTINUOUS ELECTRICAL SIGNALS.
MAGNETIC TAPE RECORDER IMPRESSES ALL ELECTRICAL SIGNALS FROM DIRECTOR ON APPROPRIATE CHANNELS OF A MASTER MAGNETIC TAPE.
TAPE PLAYBACK AND MACHINE CONTROL UNIT READS MAGNETIC TAPE TO CONTROL ALL AXES AND AUXILIARY FUNCTIONS OF THE MACHINE TOOL AUTOMATICALLY.
SERVO MECHANISMS ACCURATELY CONTROL ALL AXES MOVEMENTS OF THE MACHINE BY MEANS OF "TELL-TALE" FEEDBACK SYNCHROS IN CLOSED-LOOP CIRCUITS.

tape preparation unit which punches a master numerical tape with previously calculated decimal information; (2) an electronic computing director which converts digital information on the paper tape into phase-modulated, time-co-ordinated command signals recorded on proper channels of a magnetic tape; (3) electronic playback circuitry which reads commands off the magnetic tape and sends appropriate electrical control signals to the machine; (4) electro-mechanical machine-control units which operate in closed - loop - feedback, phase - shift, synchro-servo systems to position machine axes in accordance with taped command signals. Machine auxiliary functions and non-feed controls are operated automatically through relay circuits from simultaneous command impulses on other parallel tape channels. For example, appearance of a 200-cycle signal starts coolant flow, while on other channels such signals automatically control the oil pumps, chip conveyors, etc.

To prepare master tape, operator enters machine axes motions and time intervals on the keyboard. No conversion to binary form code is necessary. Special commands are entered in same fashion by using six auxiliary symbols supplied. "Stop" codes placed in the paper tape sequence provide intervals for tool examination and replacement as well as for checking settings of machine verniers.

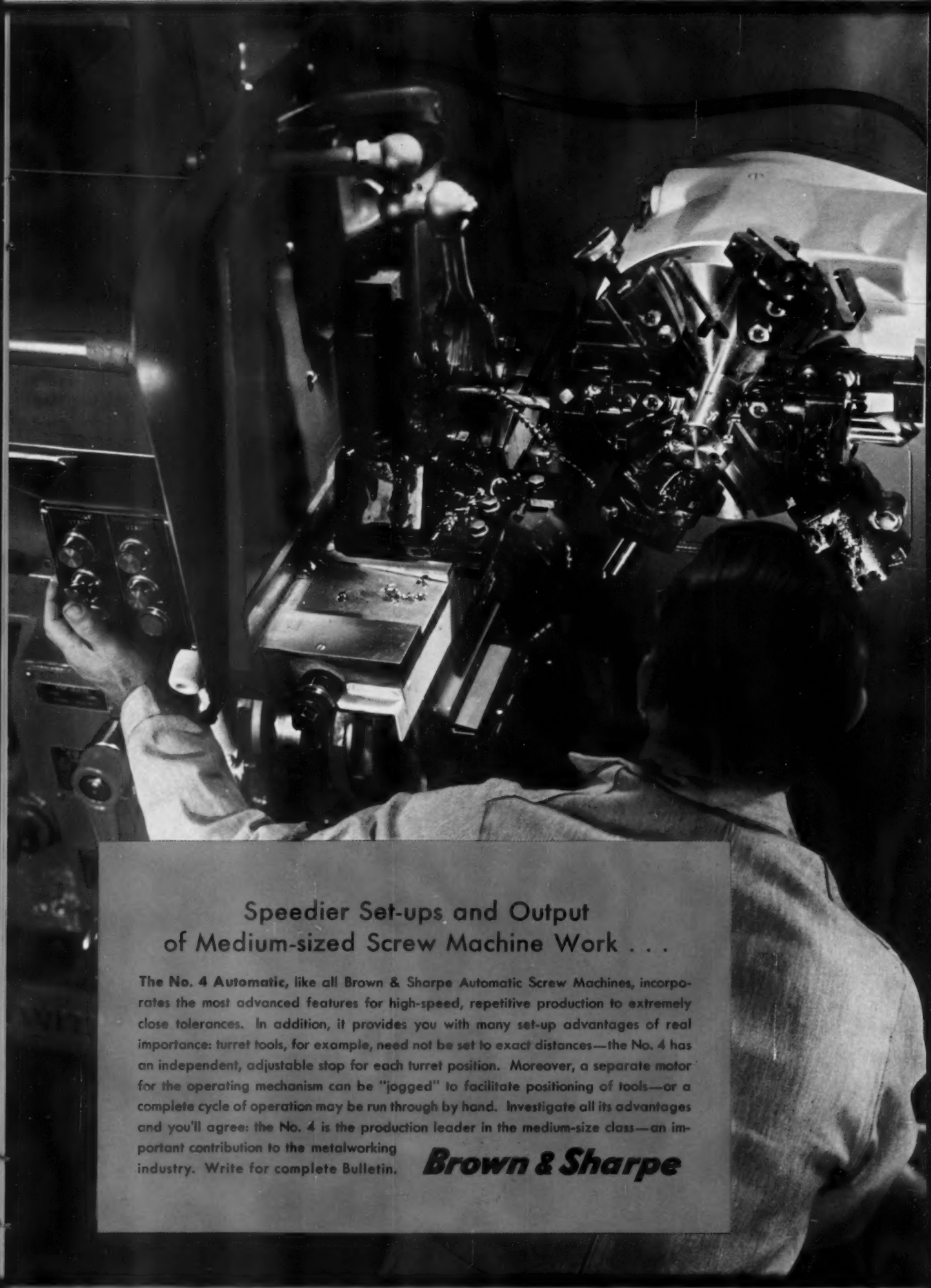
Standard calculators can be used to short cut manual computation of axes movements, time co-ordinates, tooling, feed, traverse, and other necessary data. It is the electronic computing director which processes decimal digital information, contained on the paper tape, into the phase-modulated continuous electrical signals for recording on magnetic tape. In operation, the director reads the punched paper tape line for line, storing information in special magnetic-core memory units until later commands from the director release them to secondary memory units or directly to data-co-ordinating circuits for final impressing on the magnetic tape. While the director is processing one group of commands, following groups are being read into it to assure continuous motion of the machine upon playback of the finished master magnetic tape.

Visual indicators on the director's control panel provide one fine and five coarse data repeaters, which algebraically sum distance commands for each machine axis during a program. Control of each axis is accomplished by closed-loop-feedback servo circuits. Movement of 0.100 in. produces one complete revolution of its "tell-tale" rotor.

Machine axes are driven by dc motors connected through ball-bearing nut and screw mechanisms. Synchro feedback is accomplished by parallel-mounted precision rack-and-pinion gearing.

A novel advantage of the Numericord system is the ease with which audio signals can be included in the magnetic tape. These can be used to alert the machine attendant to upcoming tool changes and planned "stop" machine inspection periods. Such "spoken" commands, synchronized with machine control cycles involving as many as five machine axes and 22 auxiliary machine functions, add to the efficiency of Numericord machining.

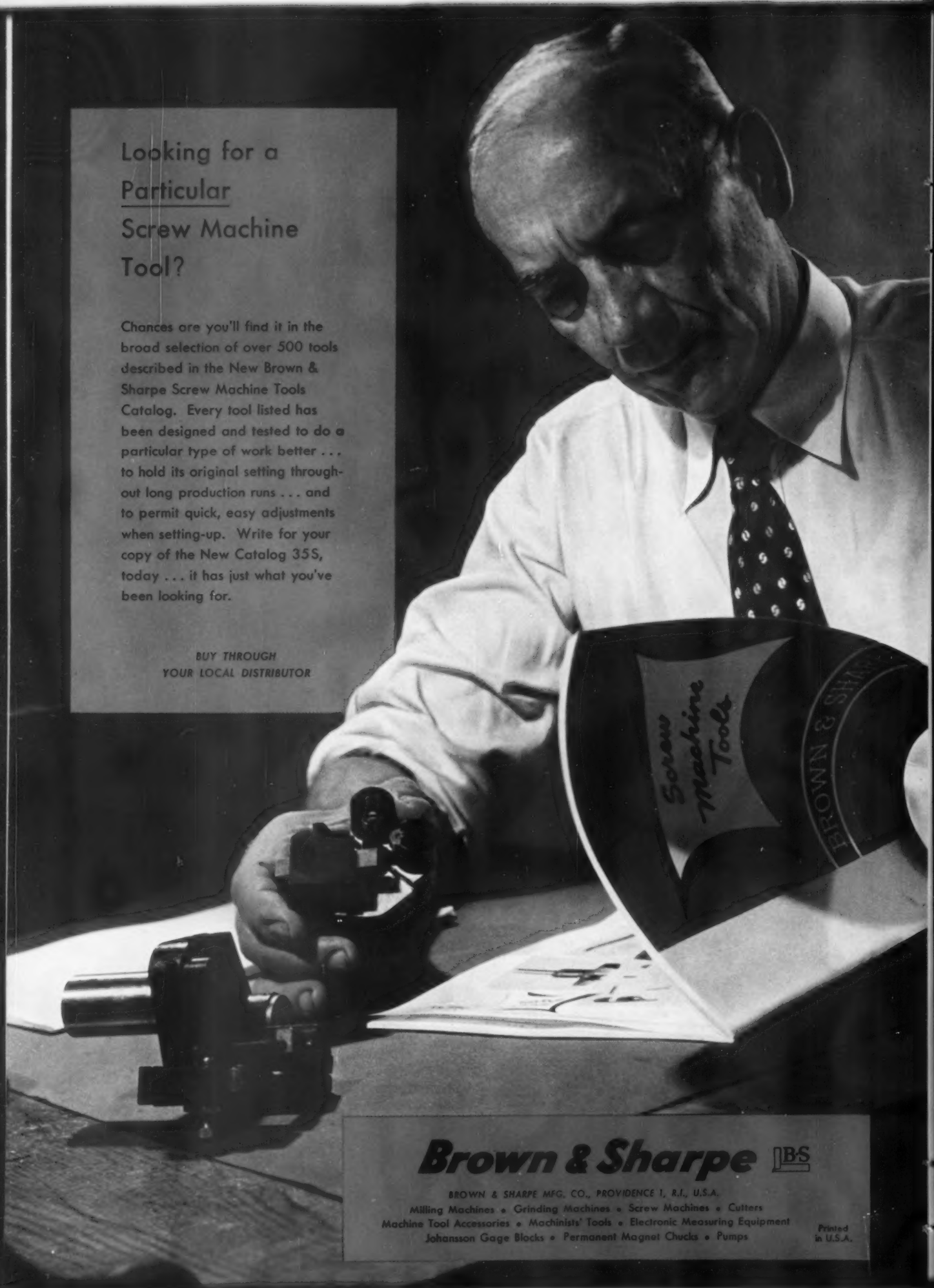
Giddings & Lewis Machine Tool Co, Fond du Lac, Wis



Speedier Set-ups and Output of Medium-sized Screw Machine Work . . .

The No. 4 Automatic, like all Brown & Sharpe Automatic Screw Machines, incorporates the most advanced features for high-speed, repetitive production to extremely close tolerances. In addition, it provides you with many set-up advantages of real importance: turret tools, for example, need not be set to exact distances—the No. 4 has an independent, adjustable stop for each turret position. Moreover, a separate motor for the operating mechanism can be "jogged" to facilitate positioning of tools—or a complete cycle of operation may be run through by hand. Investigate all its advantages and you'll agree: the No. 4 is the production leader in the medium-size class—an important contribution to the metalworking industry. Write for complete Bulletin.

Brown & Sharpe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FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 GEAR SHAVING MACHINE—*National Broach & Machine Co, Detroit 13, Mich.* 8-page bulletin S55-4 describes Red Ring Model GCR-12-in. rotary unit for internal gears from 3 to 12-in. PD, up to 4 diametral pitch, by either conventional shaving or new plunge-cut process. Production advantages, design features, machine operation illustrated.

2 AUTOMATIC DIEING MACHINES; POWER PRESSES — *Emhart Mfg Co, Hartford 2, Conn.* 40-page illustrated catalog describes dieing units from 25 to 400 tons for high-speed metal stamping and assembly operations; particularly suited for use with progressive dies. Data on 50 presses include specifications, description of special attachments.

3 SLIP ROLL FORMERS — *Niagara Machine & Tool Works, Buffalo 11, NY.* 18-page bulletin 77D illustrates and describes line of power and hand-operated machines. Specifications given, selection and operational data provided, special attachments described.

4 PRESSES — *Ferracute Machine Co, Bridgeton, NJ.* Illustrated catalogs provide specifications and features of several series. Include double crank straight side units; punching presses in standard and deep-throated models from 20 to 105 tons; catalog P-400 covers 150 and 200-ton units; catalogs 32 and 33 cover OBI presses from 32 to 200 tons.

● SLITTING EQUIPMENT — *Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 24-page circular 898-S-2 illustrates and describes line of gang slitters and accessory equipment; ranges from hand-operated, bench-mounted units to fully automatic lines. Discusses conventional-driven, pull-through, and combination types with cutter dias from 3 to 16-in. Request direct on company letterhead.

5 COOLANT FILTERS FOR GRINDERS—*Industrial Filtration Co, Lebanon, Ind.* 4-page bulletin describes Delpark coolant filters available for the Thompson grinder line. Four grinders illustrated equipped with appropriate filter. All Thompson units using wet grinding methods listed with recommended filter for each.

6 LATHE CENTERS—*Ready Tool Co, Bridgeport 5, Conn.* Bulletin L-55-1 contains illustrated information on Red-E double row bearing assembly centers. Covers shank, spindle, bull and pipe types with specifications, prices, and engineering data.

7 "AUTOMATIC ELECTROLYTIC SHAPING WITH ELECTRONIC CONTROL"—*Anocut Engineering Co, Chicago 6, Ill.* 4-page illustrated brochure explains how standard grinders, equipped with Anocut electronic control, and using electrolytic salts, have increased removal efficiency up to six times that of conventional grinders, save 90% in diamond wheel costs.

8 BALANCING MACHINES—*Gisholt Machine Co, Madison 10, Wis.* 16-page illustrated catalog on Type S Dynetric balancers. New bench and vertical models covered. Information on accessories and applications included.

TOOLS AND ACCESSORIES

9 TOOLS—*L S Starrett Co, Athol, Mass.* 478-page 75th anniversary catalog No. 27 covers 85 new items plus additions to complete line of hand measuring tools, precision instruments, steel tapes and rules, dial indicators and gages, saws, knives, precision ground die and flat stock. Sectionalized, indexed, cross-referenced. Uses and applications illustrated. Supplementary price list available (Bulletin 132 W).

10 PORTABLE AIR IMPACTOOLS—*Ingersoll-Rand Co, New York 4, NY.* 52-page catalog, Form 5200-A, illustrates complete line plus accessories and sockets. Specifications, descriptions of each size; standard and optional equipment furnished; case histories and applications included.

11 PRECISION MEASURING INSTRUMENTS—*Tubular Micrometer Co, St James, Minn.* 182-page, indexed, illustrated catalog 22 covers extensive line. Includes general information, as well as features, applications, specifications, tables. Supplementary price list and new tool booklet available.

12 FINE PITCH HOBS — *Illinois Tool Works, Chicago 39, Ill.* 16-page illustrated booklet (revised) covers the Ameri-

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can Standard 20° Involute Fine-Pitch System. Data on minimum radius, tolerances, inspection, sharpening. Includes information on non-standard F-P and non-involute hobs. Lists 55 sizes and shapes stocked of Illinite (R) F-P hobs.

• DECIMAL EQUIVALENT CHART & CALENDAR—*Dayton Rogers Mfg Co, Minneapolis 7, Minn.* 9x17 in., dated from July 1, 1955 to June 30, 1956. Request direct on company letterhead.

13 STANDARD CARBIDE TOOLS & BLANKS — *Adamas Carbide Corp, Kenilworth, NJ.* 8-page price and specifications booklet, No. 355P, covers Premium Grades 548 and 434. Table shows proper grade to use to eliminate various types of carbide failure due to incorrect selection.

14 MULTIPLE - THREAD MILLING CUTTERS—*Star Cutter Co, Farmington, Mich.* 4-page illustrated reference manual SC-2 lists tolerance standards of all commercial sizes of shell and shank-type cutters, precision and commercial ground, accurate and commercial unground classes. Includes ordering information and engineering data.

15 HEAVY-DUTY VISE — *Producto Machine Co, Bridgeport 1, Conn.* Illustrated bulletin TE2-104 describes 6-in. unit available with swivel, complete with graduated base (180°); plain, with clamping ears for swivel; or plain, with ground sides. Attachments and specifications included.

16 STRAIN GAGES, INSTRUMENTS, ACCESSORIES — *Baldwin - Lima - Hamilton Corp, Philadelphia 42, Pa.* 12-page 1955 price list for SR-4 instruments. Includes specifications and selection data for all sizes and types of bonded resistance wire strain gages.

HEAT TREATING AND WELDING

17 RESISTANCE WELDING MACHINE — *Expert Welding Machine Co, Detroit 12, Mich.* 2-page illustrated bulletin EW-3 describes line of inverted mechanical presses for variety of spot and projection welding operations. Design features and specifications listed for standard 32, 42, and 60-in.-wide platen models with fixed adjustable strokes of 5, 6, and 8 in.

18 WELDING & CUTTING PUBLICATION LIST — *Air Reduction Sales Co, Div of Air Reduction Co, New York 17, NY.* 16-page booklet briefly describes over 100 technical reprints, text books, safety booklets, slidefilms, and movies. Ordering cards included.

19 PYROMETER SUPPLIES — *Arklay S Richards Co, Newton Highlands 61, Mass.* 15-page catalog contains illustrated information on thermocouples, protecting tubes, thermocouple wires, extension lead wires, insulators, and accessories.

PLANT SERVICE EQUIPMENT

20 INDUSTRIAL EQUIPMENT—*Precision Equipment Co, Chicago 41, Ill.* 16-page illustrated catalog includes new items added to standard line of lockers, ladders, steel shelving, storage and maintenance equipment. List of conversion factors printed on inside cover.

21 ELECTRONIC TRACTOR — *Barrett-Cravens Co, Northbrook, Ill.* 8-page bulletin 552-1 describes and illustrates Guide-O-Matic unit which moves trailer trains without an operator. Automatic trackless system requires no overhead conveyor installation.

22 RUST PREVENTIVE CHART — *Daubert Chemical Co, Chicago 1, Ill.* Chart No. 255 describes characteristics of Nox-Rust preventive oils and compounds. Lists products available for machine tool preservative packaging.

23 MATERIAL HANDLING EQUIPMENT—*Arrow Products, Inc, Grand Rapids, Mich.* 6-page folder covers portable, permanent, horizontal, incline power conveyors. Applications and features illustrated.

PARTS AND MATERIALS

24 SWITCHES — *Furnas Electric Co, Batavia, Ill.* 48-page illustrated catalog 5509 covers controllers for applications requiring manually operated control. Engineering, application data, connection diagrams and dimensions of drum controllers, foot, and limit switches.

25 MACHINING TITANIUM—*Mallory-Sharon Titanium Corp, Niles, Ohio.* 8-page illustrated catalog contains specific recommendations for turning, milling, drilling, tapping, grinding, reaming, and sawing titanium and alloys.

26 VALVES—*Mechanical Air Controls, Detroit 37, Mich.* 4-page bulletin illustrates 35 varieties of MAC air valves, made up of 11 parts.

27 POWDER METALLURGY — *Hoeganaes Sponge Iron Corp, Riverton, NJ.* 4-page folder discusses product application, limitations, cost reduction. Flow chart illustrates fabrication. 4-page illustrated article outlines process and advantages.

28 VARIABLE-SPEED MOTORS — *US Electrical Motors, Los Angeles 54, Calif.* 8-page bulletin 1882 describes improved pneumatic control, Varitrol, designed into Varidrive motors. Typical automatic control applications are shown with schematic drawings explaining process.

29 RIVET SELECTOR—*Milford Rivet Co, Milford, Conn.* 4x8-in. slide-rule selector gives specific dimensions, clinch allowances, and clearances for standard rivets. Divided into four parts for bifurcated, cutlery, drilled, and extruded units.

30 INVESTMENT CASTING ALLOYS CHART — *Precision Metalsmiths, Inc, Cleveland 17, Ohio.* 11x17-in. sheet lists chemical analysis and mechanical properties of stainless, low alloy and tool steels, nickel, copper base, and aluminum alloys. Rates each as to castability, machineability, corrosion resistance, weldability, etc.

31 LEADED .50 CARBON ALLOY STEEL—*Joseph T Ryerson & Son, Chicago 80, Ill.* 4-page bulletin 14-6 illustrates and rescribes Rycut 50, supplied in annealed and quenched-and-tempered condition. Said to cut 25 to 75% faster than standard alloys in same carbon range, with up to 300% increase in cutting-tool life.

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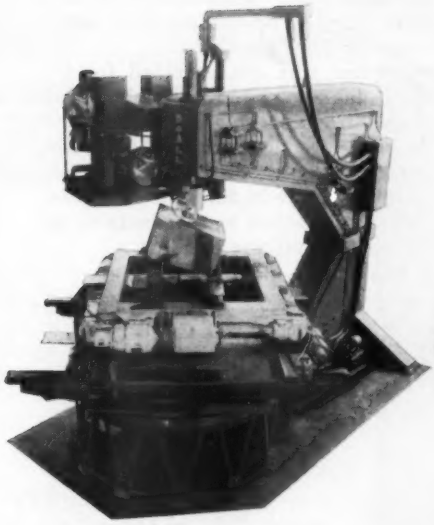

The new giant DoALL Contourmatic band saw — the world's largest — is a key part of the Air Force's "Heavy Press Program." STRESSPROOF is used on important operating parts.

on key operating parts

The lead and feed screws on the new DoALL Contourmatic must be strong since they transmit power. These important lead and feed screws must also be straight and free from growth and shrinkage, since upon their accuracy depends the accuracy of the huge extrusion dies machined on the saw. STRESSPROOF gives them this strength and accuracy.

STRESSPROOF was specified because it eliminates heat treating and its attendant distortion and warpage problems. In addition, STRESSPROOF wears well, has the necessary strength and is easily machined.

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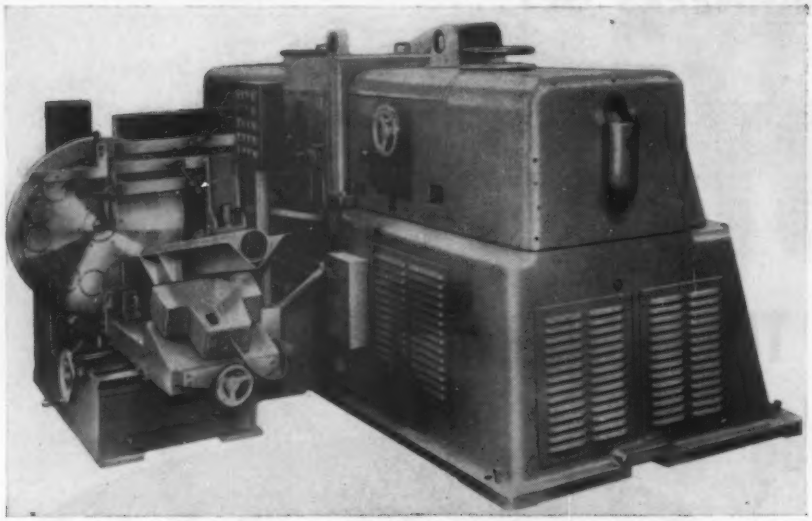


Double Horizontal-Spindle Grinder Designed for Higher Production

Entirely new double horizontal-spindle grinder announced by Besly-Welles Corp, is stated to have been designed to meet today's demand for greater accuracy and higher production. Designated Model 240, the grinder is equipped with Besly's exclusive sealed-spindle quill construction — heads are completely sealed to eliminate wear. This construction permits accurate adjustment of abrasive disks and avoids transmitting motor vibration.

All controls, motors, starters, and hydraulic units are enclosed within the machine base. Controls are automatic and are accessible from either side of the grinder. Individual dressers for each disk are pushbutton-operated. According to Besly, the design of grinder has cut down-time, disk-changing, and setup to one third of that required by other grinders. High-speed feeding is achieved through electro-magnetic pick-off disk which supplies work to the grinder in a continuous stream.

Besly-Welles Corp, Beloit, Wis

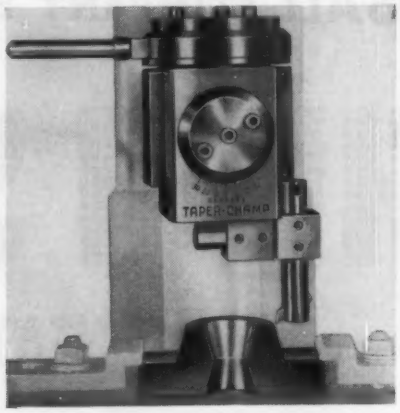
Automatic Inspection Unit Sorts into Five Groups

Automatic inspection unit for gaging and sorting parts into as many as five specific size categories plus oversize and undersize, handles more than 3000 parts per hour. Designated Autosort 101, it handles parts up to 3 in. in length and ¾-in. OD, and can be arranged for checking length, thickness, OD, or any external measurement. It can be furnished with any size range desired from 0.0002 to 0.010 in., and for sorting by increments as small as 0.000050 in., depending on range.

Parts are fed from hopper by motor-driven fingers and placed, one at at time, on anvil beneath Par-Ac gage head. Voltage produced goes through an amplifier to three contact meters. Meter hands contact arms which actuate relay system to energize sorting-gate solenoid.

Basic elements of Auto-sort are same for all applications. Mechanical elements are furnished to individual specifications. Cabinet is modified as necessary to accommodate any desired means of loading hopper and also to allow discharge of work.

Cleveland Instrument Co, 735 Carnegie Ave, Cleveland 15, Ohio



Versatile Tool Bores and Turns Tapered and Straight Surfaces

Taper-Champ, a new tool for boring and turning both tapered and straight surfaces, tapers in either direction. It is designed for use on jig borers, boring mills, and for blanking, piercing dies, drop forge dies, patterns, and similar operations. Unit may be operated either vertically or horizontally.

Bronze gibs are provided for instant take-up when wear develops. Rapid traverse of slide is provided in both directions through rack and pinion. Shanks are interchangeable, permitting use in different machines, and are attached to tool body so as to assure extreme rigidity.

Chandler Tool Co, Muncie, Ind

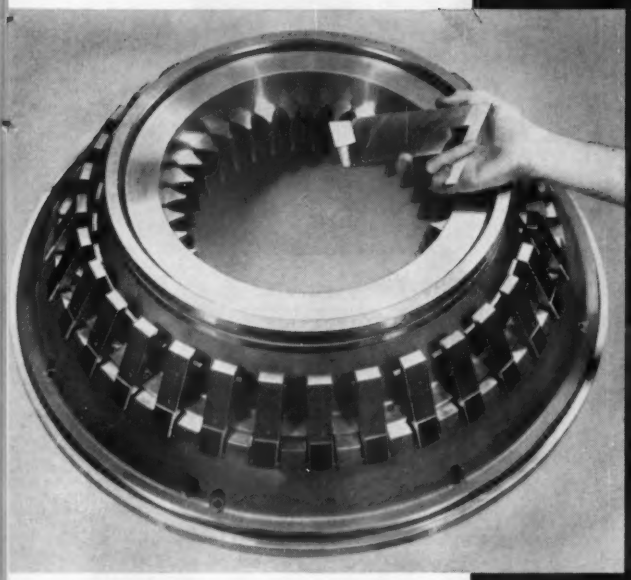
Small Holes Drilled With Precision Head

Mico precision drillpress head, shown attached to one of the standard bases of the Mico pantograph engraver, was developed for small-hole application. A universal motor belt drives the precision spindle assembly through a multi-stage pulley. From mounting post to chuck center is 6½ in.; distance from work base surface to chuck is adjustable to 6 in. Uses No. 0 Jacobs chuck.

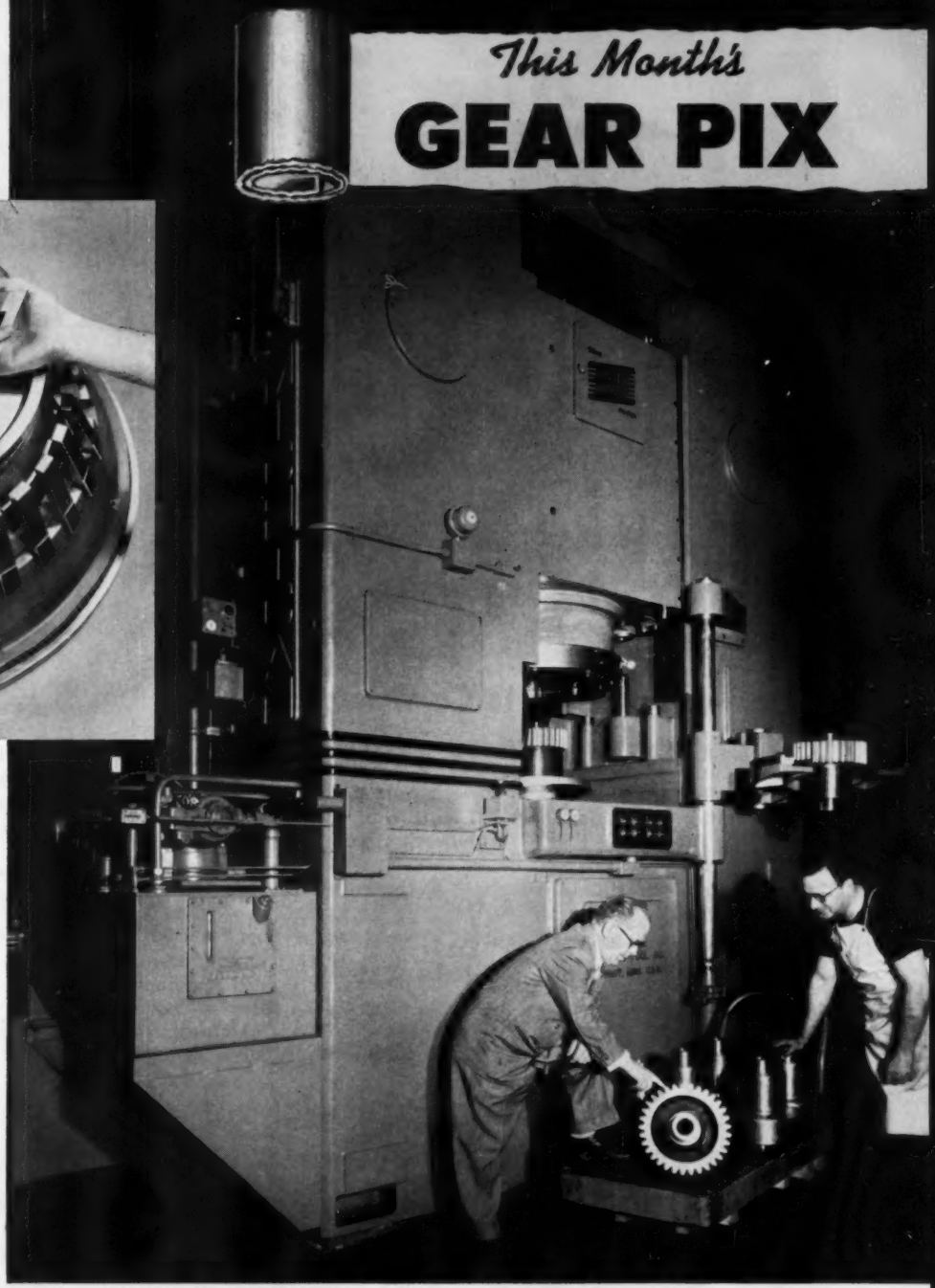
Mico Instrument Co, 80 Trowbridge St, Cambridge 38, Mass

This Month's

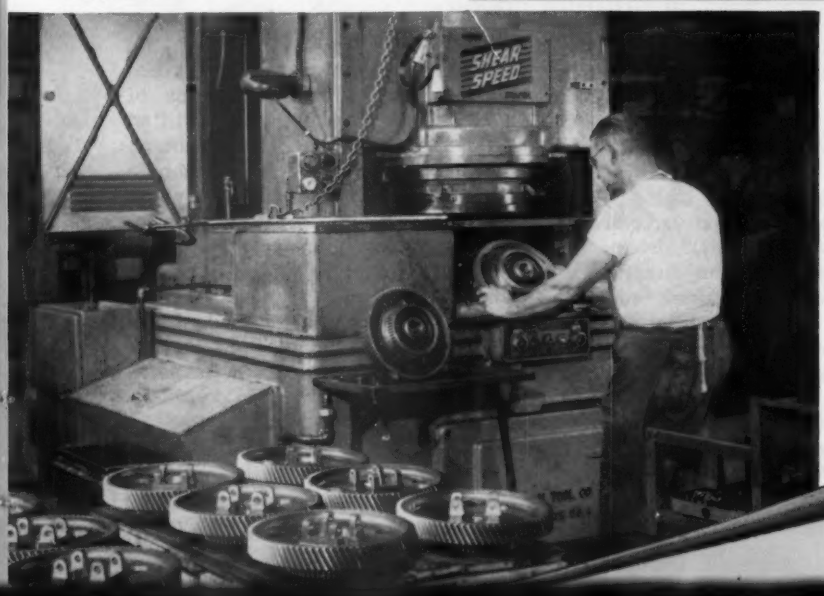
GEAR PIX



▲ RUGGED ACCURACY is built into this SHEAR-SPEED tool holder used to cut the 33-tooth bull gear in 6½ minutes on the new giant SHEAR-SPEED.



▼ VERSATILITY—Shoulder gear (7.25" dia. x 1" face) being formed on this 18105 SHEAR-SPEED gear shaper at the rate of 23 per hour, is one of 12 different tractor gears regularly produced on this fastest of gear cutting machines.

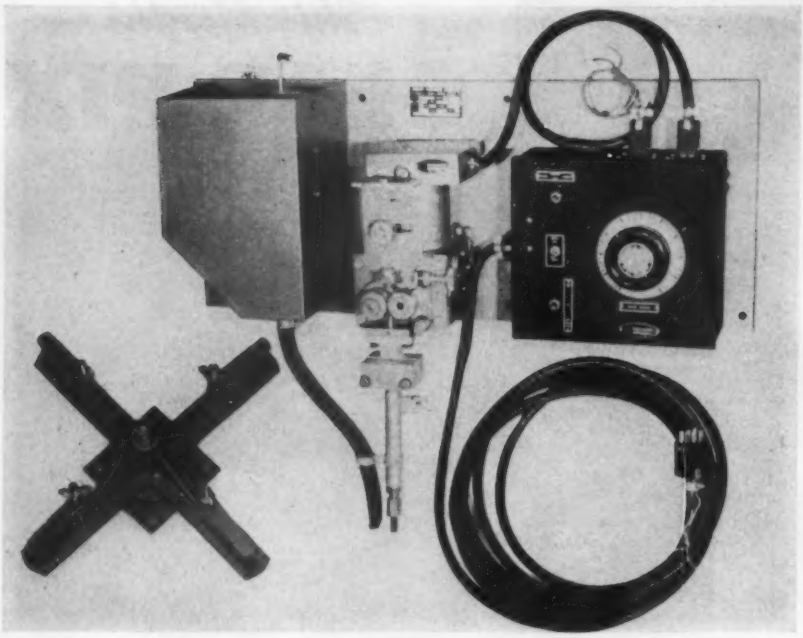


▲ VERITABLE GIANT is this new SHEAR-SPEED gear shaper. Cutting time on the tractor bull gear shown is 6½ minutes compared to 3 hours by former methods. New bulletin describes the two new SHEAR-SPEEDS with capacities up to 6" face width, 13" and 20" maximum diameters.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO., LTD.

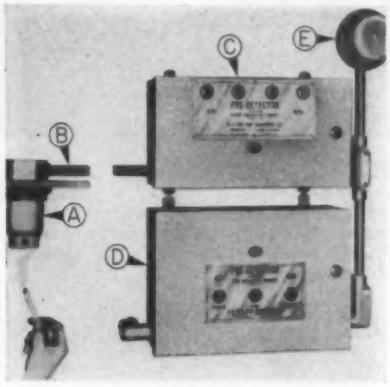


Automatic Head Is Companion To Constant-Voltage Welder

Hobart has announced a new automatic welding head designed especially for use with the Hobart constant voltage Powromatic welder. The unit includes simplified controls, wire feed, and current pick up assembly, flux hopper, and wire reel. It has a capacity for automatic welding with wire sizes 0.035 to ¼ in. inclusive. One set of wire feed rolls are standard equipment. Capacity of the flux hopper is 25 lb and the adjustable wire reel will handle coils 12 to 16-in. ID, 2½ to 4 in. wide.

Simplified controls are enclosed in a steel cabinet 11¼x6 in. and consist of three toggle switches on the front panel: turn on-off welding current to the head; change from automatic to hand travel; and determine direction of wire feed and inch wire up or down. A rheostat inside front panel with handwheel control on the outside gives choice of wire speeds.

Hobart Bros Co, Troy, Ohio

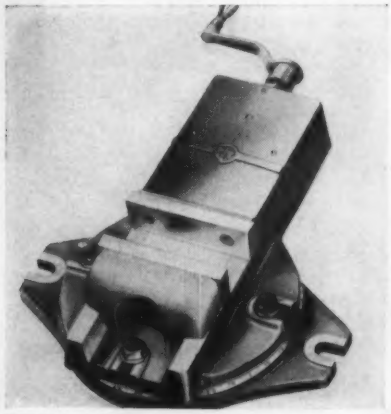


Fire Detection System Activated By Invisible Combustion Gases

Radio-active, automatic C-O pre-detector system gives visual and audible alarms within seconds after ignition of various types of fires, without dependence on visible smoke or heat for actuation. Pre-detector heads, containing the radio-active element, spaced on centers up to 60 ft apart or up to 30 ft from side walls, quickly detect the smallest smoldering fire and indicate location where it occurs.

Heart of the system is an overhead detection device electrically connected to a fire-indicating cabinet. With a single circuit, the pre-detector heads are connected directly to the cabinet. When combustion gases or smoke are present, relays in the cabinet function to sound alarms, close fire doors, activate fire extinguishing systems, or perform other fire protection functions. A space-indicating cabinet, connected through separate circuits, shows visually by number the area affected, and contains relay contacts which will shut down ventilation or perform similar functions.

Pyrene C-O-Two Fire Equipment Co, Newark, NJ



Machine Vises

Line of accurate machine vises, including quick-operated model, has specially constructed rear jaw which is movable, and slide under fixed front jaw. This allows extremely accurate clamping since neither jaw can lift or tilt. It also provides wide area of support for the clamped part.

All sliding surfaces are finely ground and are accurate to 0.0004 in. Steel screw is constructed so that it is subject only to tension. Low height allows more room when vise is mounted on machine.

Alina Corp, 401 Broadway, New York 13, NY

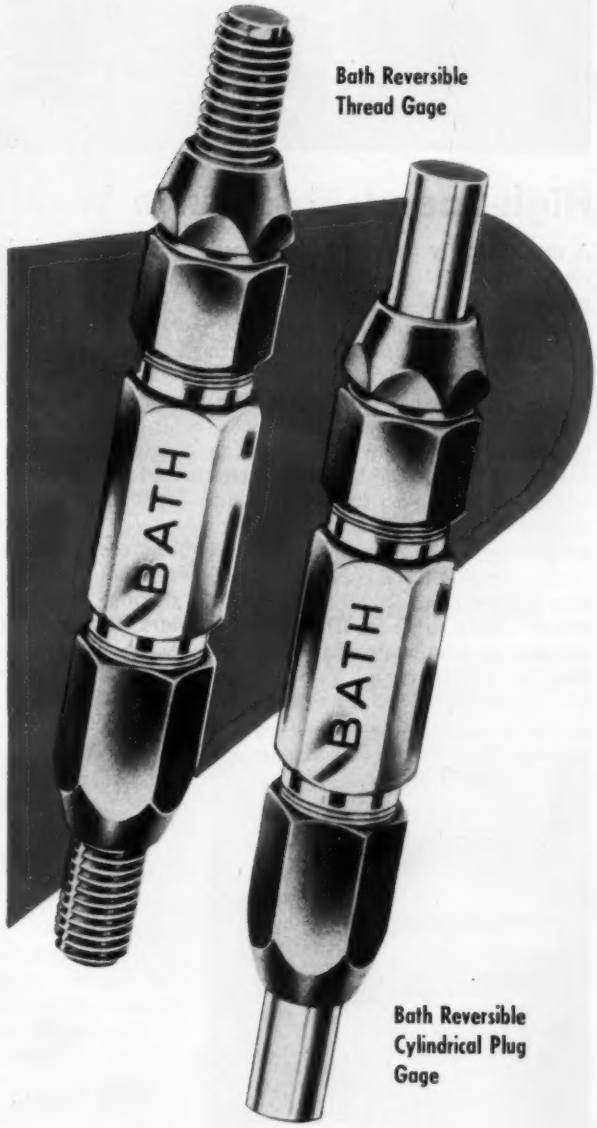
Hydraulic Drum Lift

Portable self-centering drum lift uses an easy-lock girdle by means of which the drum is grasped and lifted from vertical or horizontal position. Girdle permits one man to handle easily drums of materials weighing as much as 700 lb. Girdle can be positioned by one man in a matter of seconds. By releasing the brake on the lift-arms the drum can be rotated for mixing of contents. Ball-bearing casters enable one man to transport loaded drum with ease. Positive foot-operated brake holds drum lift on slope or incline.

Sterling, Fleischman Co, Broomall, Pa

Are you GAGING with Truth . . . or Consequences?

- If you do not know the truth about gage quality . . . you're apt to pay the consequences!
- Manufacturers of quality products have found that they can't afford to take a chance on inferior gages because of lower initial cost . . . it's false economy!
- Gages that pass work that should be rejected . . . can cause the loss of customers.
- Gages that reject work that should pass . . . cut down profits.
- It is NOT true . . . that lower price gages with uncertain accuracy, give you more for your money.
- It IS true . . . that the same skilled craftsmen, engineers, laboratory and quality-control technicians who are proficient in the manufacture of Bath Ground Thread Taps — uphold the traditional Bath standard of quality in the production of the Bath Gage Line. You can depend on uniform accuracy in Bath Gage performance.



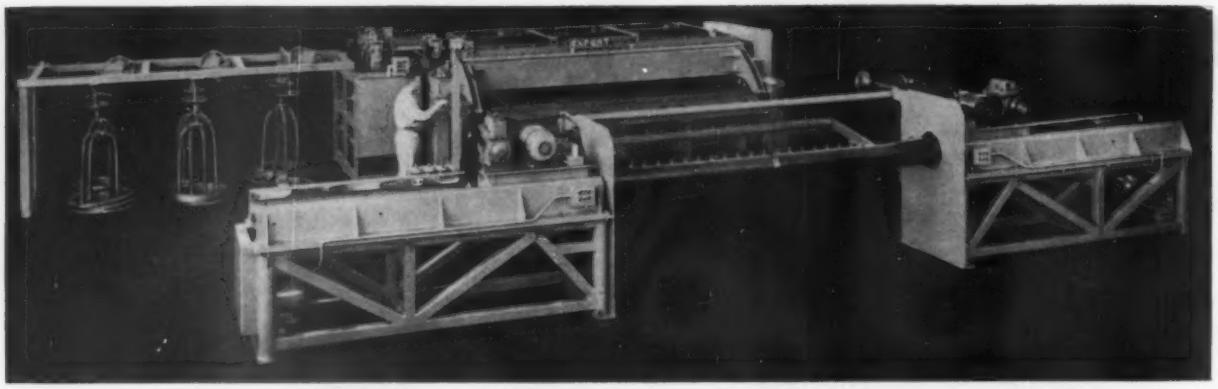
Bath Reversible Thread Gage

Bath Reversible Cylindrical Plug Gage

to be Safe . . . it pays to buy Bath Gages!

Cylindrical Plug Gages • Plug Thread Gages • Ring Thread Gages • Thread Measuring Wires • Master Setting Discs • Internal Micrometers • Ground Thread Taps

JOHN BATH & CO., Inc.
22 Grafton St., Worcester, Mass.



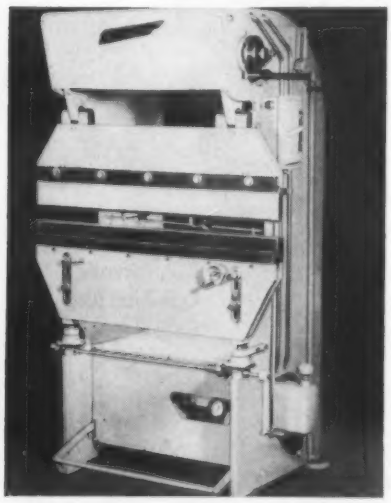
High-Speed Resistance Welding Machine

A mechanically operated high-speed resistance welding machine which produces wire mesh up to 13 ft wide from coiled steel wire in a continuous operation occupies a floor space 35x32 ft. It will fabricate mesh from 4 to 14-gage wire at a rate of 60 cross wires per min. Up to 79 longitudinal wires with wire spacing from 2 in. up can be handled. Cross wires can be spaced from 2 to 12 in. High-speed operation is accomplished by feeding six cross wires at a time, cutting them off and conveying them to a hopper from which they are fed one at a time to a resistance welding crosshead upon which up to 79 individual spring-loaded welding guns are mounted. This multiple cross-wire feed unit is for use on heavy-gage cross wires up to ⅜ in. dia. Where a light-gage wire is used a single cross-wire feed is provided.

The machine consists of five basic units; a longitudinal wire straightener, a multiple cross-wire feed, straightener and cutoff machine, resistance welding crosshead, and a slitter and coiler. It is entirely mechanically operated. One main shaft driven by 15-hp motor and speed reducer combination controls all functions of longitudinal wire indexing, crosswire hopper operation, and welder crosshead operation through eccentrics and toggle linkages. The drive roll motor is a two-speed type, the higher speed producing wire at a rate exceeding the requirements of the welding machine. The cross-wire cutoff mechanism is an eccentric, and crank-driven by 3-hp motor through electric clutch and brake unit. A 1-hp motor powers the five screw convevors.

The coiler has two 10-in.-dia mandrels which pilot into each other. They are powered by 5-hp motor and speed reducer units. To remove wound coils each mandrel is retracted axially by a 5-hp motor and leadscrew mechanism. A take-up roll controls mandrel motor operation to keep coiling of mesh in synchronism with welder.

Expert Welding Machine Div, 17144 Mt Elliott Ave, Detroit 12, Mich



Hydraulic Press Brake Has Stroke Control Selector

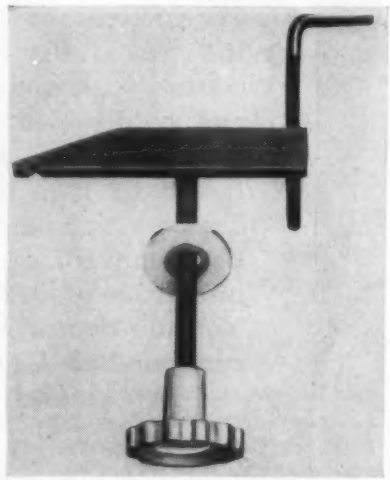
Hydraulically operated Di-Acro Hydra-Power press brake with a 36-in. length of bed and ram is said to develop 12 tons of pressure.

Important advantage of this machine is stroke control, according to the manufacturer. The most practical length of stroke for each job can be preset, and ram can be stopped or reversed at any desired point in a work operation.

Power is applied to a rotary hydraulic cylinder mechanically linked to the cam shaft. Oscillating action of this cylinder has a maximum movement of 270°. Maximum power or pressure is obtained by working off the bottom of the stroke. Any length of stroke can be secured with quick adjustment of the stroke control selector. Production rate of 60 strokes per minute is possible on a ¼-in. stroke. At the full 1½-in. opening, a rate of 24 spm can be maintained. Ram speed remains constant whether stroke is short or long. Adjustable relief valve can be preset to apply only maximum tonnage required to bend or punch the metal; beyond that amount of pressure the machine will throw out, or stop. Operator can back off the ram at any point in the operating cycle by touching a reverse lever and using the foot control.

Standard equipment includes a back gage, adjustable both vertically and horizontally.

O'Neil-Irwin Mfg Co, 512 Eighth Ave, Lake City, Minn



Drillpress Clamp

Hunter Tools has announced that the Hunter T-clamp now has taper on the end of the hold-down bar which enables it to be used in close quarters. Another new feature is the V-notch which has also been placed on the bottom part of the hold-down bar. This notch makes it easier to hold down round and odd-shaped material.

Hunter Tools, Whittier, Calif

1st in a Series . . .

OF HIGH PRODUCTION CASE HISTORIES

ASK BAIRD ABOUT IT

Before and after views of the machining operations performed on the Baird 76H Automatic Chucking Machine.

8 OPERATIONS ON HEAD CASE

OF COLD DRAWN MILD STEEL

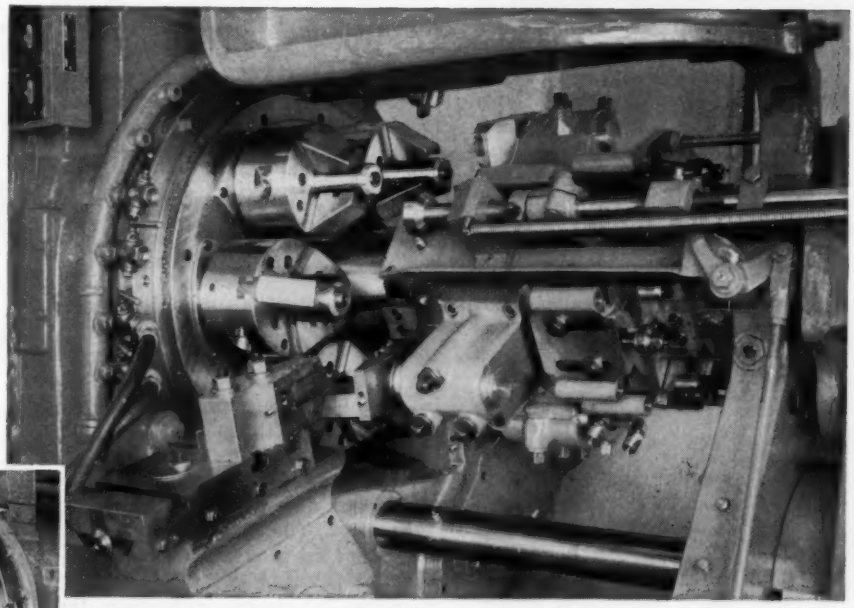
Production . . .
198 PIECES PER HOUR

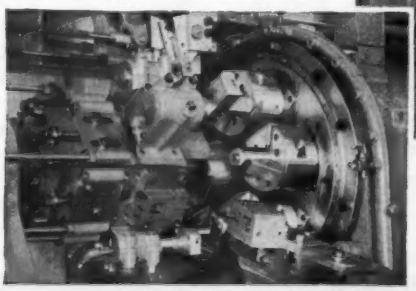
The machine tooled for production of these parts at extremely low cost is the Baird 76H Automatic Chucking Machine.

Operations are: rough and finish turn the smaller O.D. . . . face the shoulder . . . rough and finish larger O.D. for threading . . . face the end, cut recess for threading die and chamfer the ends. Prevention of tool marks on the finished surfaces is assured by indexing the work away from the tools at the conclusion of the cutting.

Even though you may not have Head Cases to finish, there are many similar jobs that can be produced at most favorable competitive costs on the Baird Chucker with high speed tooling set-ups.

"Ask Baird about it." Write Dept. AM.



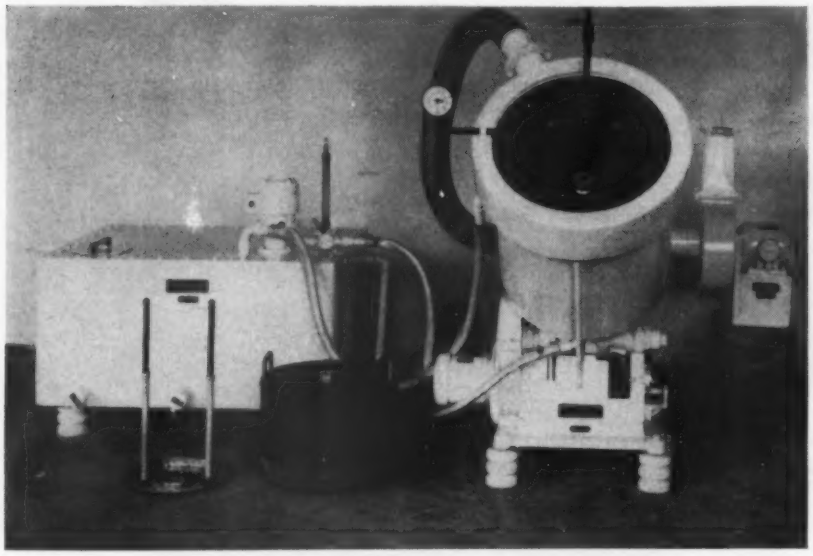


***(Above)* Front view of tooling showing 4 of the 6 chucks. *(Left)* Rear view of the tooling.**

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC METHODS • [illegible]



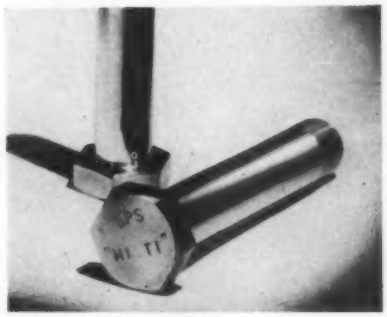
Barrel Chrome-Plating Machine Offered in Three Types

A barrel-type chrome-plating machine which does away with racks or fixtures in the plating of small parts makes it possible to plate parts by simply dumping them into a basket and processing them for about ten minutes. A uniform bright or dull chrome plate may be obtained without the need for hanging small parts on racks or jigs.

These barrel platers are available in three general types. One with capacity of 1¼ gal. is for short or intermittent plating of very small pieces. The 10½-gal. unit was specially designed for long production, equipped with vapor exhaust and either a water jacket for cooling or reserve tank through which the solution is circulated. Both models are supplied with two baskets. The third unit, designated the automatic model, was designed for mass production plating of small parts and is continuous in operation. Parts are fed into a funnel and brought out after plating by a worm conveyor. With a capacity of 13 gal. and plating cycle from 8 to 10 min, machine produces 85 lb an hour.

The unit illustrated is the second one, designated "standard" and designed for long production runs.

Dawson Corp, North Pelham, NY



Titanium Shear Bolts Have High Endurance Strength

Titanium shear bolts for use in aircraft construction have been developed by Standard Pressed Steel. These fasteners are said to equal or exceed present-day steel shear bolts, not only in shear strength requirements, but also in fatigue life.

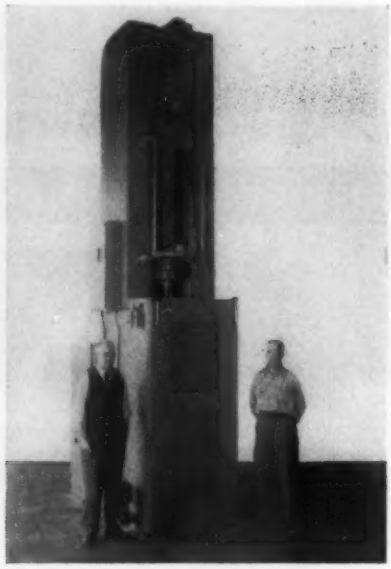
Size-for-size replacement of steel bolts by Hi-Ti titanium bolts (Type NAS 464), which weigh only 57% as much, could cut as much as 500 to 1000 lb from the weight of larger aircraft. Pound-for-pound, the ¼-in. titanium bolts proved to have more than five times the endurance strength of comparable ¼-in. steel fasteners.

SPS has data available on ¼ and ½-in. sizes. The company states that it is prepared to produce in quantity titanium shear bolts in sizes ranging from No. 10 up through ½-in.-dia.

Standard Pressed Steel Co, Jenkintown, Pa

Black granite angle plate has been developed for use with microflat granite surface and layout plates. Standard size combinations range from 4x4x4 to 12x12x12. Larger sizes available to specifications.

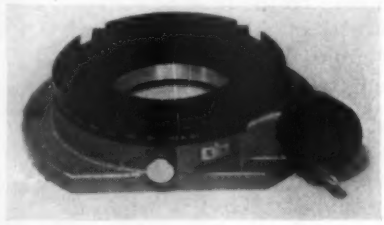
Collins Microflat Co, 2326 E 8th St, Los Angeles 21, Calif



Internal Broaching Machine Model With 60-in. Stroke

The VPD-15-60 vertical pull-down internal broaching machine has 60-in. stroke and is offered with capacities of 15, 20, and 30 tons. Previous models of this machine had 36- and 48-in. stroke capacity. There is selective positioning of the upper broach retriever cylinder so a wide length range of broaching tools may be utilized. Broach handling is fully automatic for high production work.

Acme Broach Corp, Milan, Mich



Rotary Table

Model CS-67 rotary table can be used to advantage on small production milling, drilling, and engraving machines. It is constructed of heat-treated Meehanite base casting with worm and worm-wheel movement. The worm is locked in two ball thrust bearings and provisions have been made for adjustment between steel worm and cast bronze worm wheel to eliminate backlash. The handwheel will read to one minute.

The working surface of the rotary table is 5 in. in dia and provided with four T-slots for ¼-in. bolts and 3-in. hole in the working area. Overall height is approximately 1½ in. The working area hole of 3-in. dia may be filled with adapters for smaller plug diameters.

Custom Scientific Instruments Inc, Arlington, NJ

Modernize with Schrader shear controls

Just a light touch of the toe is all it takes to operate your shear after you equip it with a Schrader Pneumatic Control.

Have you ever watched your operators riding the foot lever to cut heavy gauges of metal? Sometimes taking two men to do the job?

Now that is all changed. When Schrader Equipment operates the shears with tireless muscles of compressed air, one operator can do the work of two. The foot pedal can even be positioned to operate at a distance. It all adds up to top production—with minimum fatigue.

This is just one example of hundreds where Schrader Air Equipment can speed production . . . lower fatigue . . . increase safety. To find out how you can put Schrader Air Equipment to work in your plant, send us a letter describing your installation—or fill out the coupon below.

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Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges

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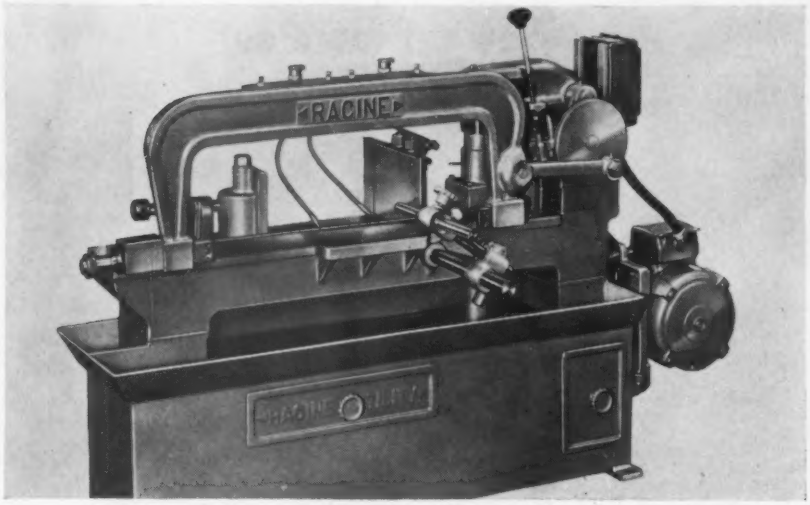


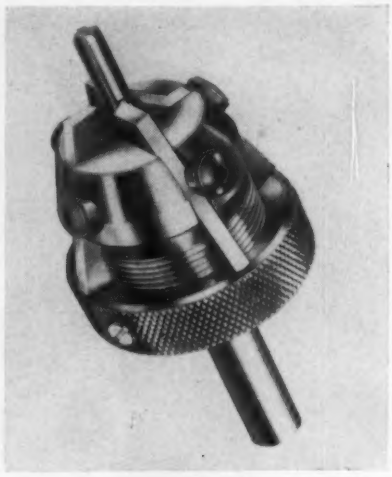
Hydraulically Operated Metal Saw Handles Wide Variety of Work

Wide-utility, large-capacity, hydraulically operated metal saw designed to handle full range of general cut-off work from tool and die steels to mild bars, tubing, and structural shapes up to 8x16-in. size, eliminates the need of a clutch and uses a single limit switch to control the drive. At completion of each cut motor stops and saw frame automatically rises.

Unit is equipped with self-positioning vise for cutting any angle to 45.° Large coolant reservoir and separate dry pump compartment are included. Saw is fitted with six cast-iron gibs having complete horizontal and vertical adjustment. Frame and guide are counter-balanced.

All revolving shafts are fitted with pressed, lubricated bronze bushings. An adjustable height gage limits travel of the saw frame. Pressure of the blade is controlled by a single graduated dial with rate of feed controlled by small throttling valve.

Racine Hydraulics & Machinery, Inc, Racine, Wis



Tube-Burring Tool

Genesee has announced a standard tube-burring tool designed to face the end, chamfer the outside, and chamfer the inside of standard tubing.

It is furnished with a pilot reamer which guides the tool for uniform chamfers and eliminates burr on the inside. Pilot reamer is ground 0.0015 to 0.002 in. under the tube ID and is ½-in. long. Tool is adjustable for accurate size control and available in sizes for tubing with OD ranging from 3/16 to ⅝ in. and with wall thickness from 0.020 to 0.049 in.

Genesee Mfg Co, Inc, 566 Hollenbeck St, Rochester 21, NY

Semi-Automatic Control Unit For B&S Model 00 Machines

Semi-automatic control unit for Brown & Sharpe Model 00 machines, Count-O-Larm keeps accurate count of parts produced, never counting part which does not measure up to specified length, and eliminates practice of having machines run without stock. The unit sounds a loud buzzer and illuminates a bright red light when machines are out of stock.

Heart of the system is a revolving stop equipped with special built-in switches and mounted in the machine's turret. This stop picks up current from the machine and transmits it to a feed drum switch box, then activates the precision-geared, extremely accurate counter.

In the case of machines using a revolving shaft through the turret, or if all turret holes are filled with cutting tools, machine can be equipped with swing stop incorporating built-in switches.

Additional efficiency is provided because should collet stick and refuse to open, or should feed-finger become loose, stock will not be fed out to its full length and Count-O-Larm will sound its warning. It is stated that the unit increases machine output by 25% merely by signaling operator when machine is out of stock.

Count-O-Larm, 1271 W North Ave, Chicago 22, Ill

New Ball-Bearing Unit Has Two-Bolt Flange

A two-bolt flange ball-bearing unit interchangeable with the Sealmaster four-bolt flange units on the diagonal bolt hole dimension is available in shaft sizes from ½ to 2 3/16 in. Unit retains all design features such as zone hardening, self alignment with locking pin and dimple, and labyrinth seal.

On new installations the two-bolt flange unit eliminates two fasteners, as well as punching or drilling operation for two mounting holes. As a replacement bearing the unit fits the diagonal bolt centers on present units and carries same load rating for given shaft size.

Stephens-Adamson Mfg Co, Aurora, Ill

THE NEW

LOW COST

SINGLE DISC JOHNSON CLUTCHES

This is "it" . . . a Single Disc clutch that stays cool on the job . . . in both horizontal and vertical installations. The answer is "Separator Springs," the same feature that has popularized our Maxitorq Clutch.

If extreme compactness is not an essential, the Johnson Single Disc Clutch will meet or beat all competition . . . for applications in the field of light machinery . . . as a better clutch at a competitive price (see typical applications at right).

Available are two capacities, No. 350 — 3 h.p. max. and No. 450 — 6 h.p. max. A simple hex key frees the knurled ring for easy manual adjustment. The "floating" disc prevents drag, abrasion, and heating in neutral. And several driving combinations may be obtained, including V-belt.

For positive control of power transmission in its field, the Single Disc Johnson is tops. Write Dept. AM-6 for complete specs.

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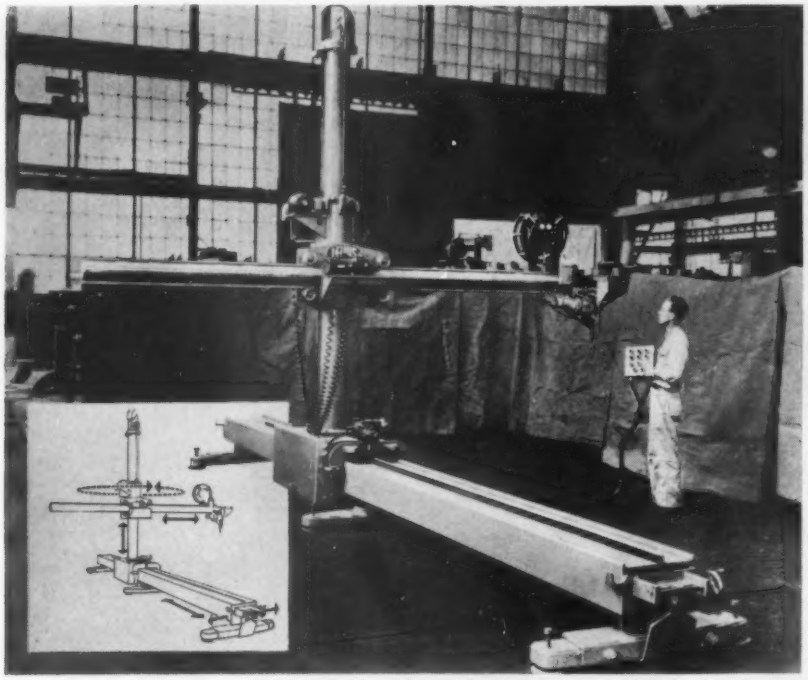
Accessory Drives, Air Compressors, Bag Making, Boat Drives, Bread Wrapping, Chain Drives, Combines (farm), Conveyors, Crop Seeders, Cultivators, Dusting Machines, Feed Grinders, Floor Scrubbing, Fruit Cleaners, Gasoline Engines, Generator Drives, Hay Balers, Hoists, Loaders, Lawn Mowers, Milk Coolers, Mixing Machines, Motor Scooters, Packaging Machines, Paper Shredders, Power Fans, Power Saws, Power Take-offs, Pumping Equipment, Sand Spreaders, Sewing Machines, Spraying Equipment, Textile Machinery, Threshers (small), Tobacco Machinery, Tool Grinders, Tractors (garden), V-Belt Drives, Vegetable Sorters.

2CJ55

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT



Automatic Welding Fixture Has Three-Directional Operation

Universal welding fixture designed to handle a variety of weldments has full portability, simultaneous 3-directional travel, 360° boom rotation, and an adjustable base. Any standard head can be used with this fixture for automatic welding, flame cutting, or hardening operations.

Adjustable base reduces normal setup time; precise alignment for longitudinal and transverse welds is accomplished rapidly by adjusting wheel at one end of base. After setup, unit is operated by remote control pushbuttons—speed is infinitely variable to 72 ipm max.

Full portability is featured in this fixture which has a lifting eye at top of column. The welder has 18 ft of longitudinal travel and can be furnished with booms and columns of various lengths. Transverse travel of boom and clearance under it range from 8 to 12 ft.

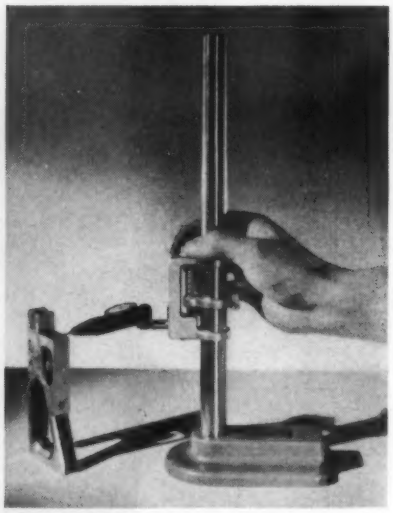
Lewis Welding & Engineering Corp, 68 Interstate Street, Bedford, Ohio

Abrasive Belt Grinding At High Belt Speed

The Superspeed belt grinder and sander has built-in speeds in excess of 10,000 sfm which reportedly results in 300% higher production with an increase in belt life up to 3000%. Company reports that previously discarded belts have been reused with efficiency. Super speeds are said to be effective on a wide range of materials such as die castings, ferrous and nonferrous castings, machined parts, corrosion-resistant steel, titanium and non-metallics.

Model No. 150 uses 1½ x 60-in. belt and machine utilizes less than 1¾ sq ft of floor space. Removable graphited platen and adjustable tool rest are standard equipment. One piece, double row, sealed New Departure bearings are used. Contact wheel is precision ground and balanced. Belt angle is adjustable over 90°. Belt changing requires no readjustment with automatic take-up and positive tracking. Unit is manufactured in bench and pedestal models, equipped with either ¾ or 1-hp motor (single phase) or ¾, 1 or 2-hp (three phase).

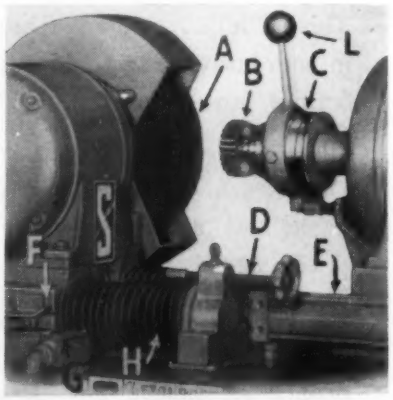
Anchor Machinery Co, 229 W Orange Grove Ave, Burbank, Calif



Height Gage

Utility height gage for tool and die makers, layout men, and others, can be used as a mount for indicators, scribing tools, magnifying lenses, and microscopes. Gage has reversible heads which permit gaging from the surface plate to a height of 14 in. Accuracy is controlled by first locking the coarse adjustment knob in approximate position, and then moving the fine adjustment to zero-in the indicator. The fine adjustment does not require further locking.

C M T Co, North Rd, Cromwell, Conn



Automatic Brushing Lathe

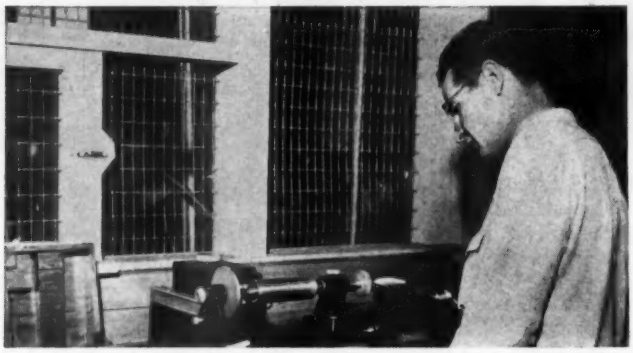
Automatic - cycle high - production lathe was designed for deburring both face edges of gear and sprocket teeth simultaneously with use of two 12-in.-dia brushes spaced for contact with opposite radii of the gear. It is suitable for work from 3 to 10 in. in diameter.

After the deburring operation is completed, the wheelhead automatically traverses to starting position with wheel and work motors instantly stopping. Each cycle reverses rotation for efficient brush life.

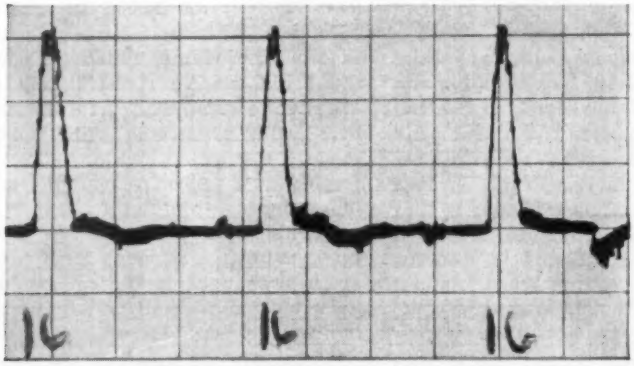
Also available with twin work head.

Standard Electrical Tool Co, 2480 W Sixth St, Cincinnati 4, Ohio

HY-PRO SPECIALIZES TAP TESTING



ACCURACY in Hy-Pro taps is measured in this Lead Check machine up to .00001 in., to guarantee precision operation for you.



EVERY TAP IS PRODUCTION-TESTED AT HY-PRO—as indicated on their exclusive Torque Test Chart, which registers cutting power up to 2000 inch lbs.

... to give you more operations per tap

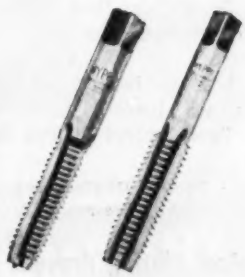
Hy-Pro specializes in producing taps. Every step in the production, from design to shipment, receives the full attention of Hy-Pro specialists.

Each tap is made under the severe standards of Hy-Pro, and is individually tested and checked before it is sent to your production line. It is this consistent quality which has helped Hy-Pro win the reputation of "*The Tap Specialists*".

This specialized production can help cut your costs. Contact your local distributor, or call Hy-Pro direct. You will benefit from a full line of high-quality taps, backed by the experience of specialized engineering.

REG. U.S. PAT. OFF.

HY-PRO



HY-PRO TOOL CO., NEW BEDFORD, MASS., U. S. A.

DISTRIBUTORS IN ALL LEADING CITIES

ADDITIONAL WAREHOUSES:

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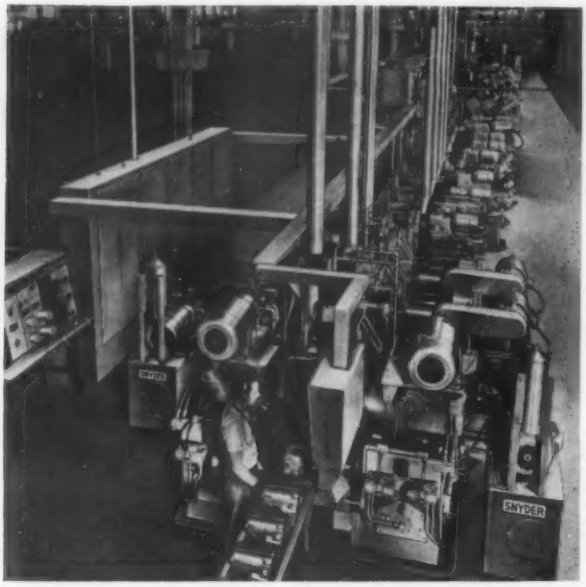
Piedmont 5-4337	University 4-1077	Garden 4-0217	Market 2-4318



Sectionalized Automation Feature Of Snyder 150-ft-long Machine

A new in-line transfer machine featuring sectionalized automation is 150 ft long, made in four individual sections, and performs 182 milling, drilling, tapping, and boring operations on a cast-iron automotive automatic transmission case. It produces 100 cases per hour at 80% efficiency.

Each section with single transfer line can be individually controlled, loaded, and unloaded. Individual transfer mechanisms are provided for each section. When one operator controls all sections, transfer bar controls operation of each.

The hydraulically powered, electrically controlled machine has single control panels for each section. Special devices orient the parts to three different positions for processing through the various machine sections. Duplex boring spindles in which individual inserted-tooth milling cutters are mounted on separate concentric spindles are featured in two stations on the machine. Compound milling slides in which the cutters feed to depth and then cross-feed are also incorporated.

All boring, facing, and milling cutters are inserted-tooth carbide types. Tool control boards are provided.

Snyder Tool & Engineering Co, 3400 E Lafayette Ave, Detroit 7, Mich

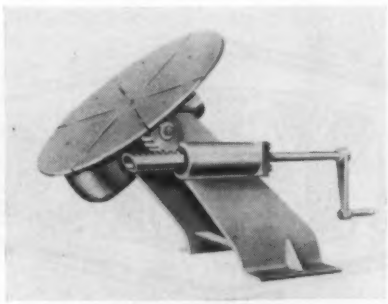
Chromium Plating Process Deposits Directly on Steel

Production plating process deposits a new plate called Crack-Free Chromium said to be free of any structural imperfection that would allow corrosive materials to come in contact with the underlying surface being protected. It can be plated directly on steel, without undercoat of nickel or copper and nickel.

Additional properties of the deposit, according to the company, include low coefficient of friction, excellent adhesion, non-galling surface, and superior ductility as compared to ordinary chromium finishes. The light gray matte appearance can be buffed to a high luster.

Plating is done with a special chromic acid bath having automatic regulation of the catalyst concentration. Standard equipment and procedures are used. Bath is prepared by dissolving the proper amount of a single compound, Unichrome SRHS Compound CF-500 in water. Same compound is used for maintenance. Plating speed is about the same as that of ordinary chromium.

United Chromium, Inc, 100 E 42nd St, New York 17, NY

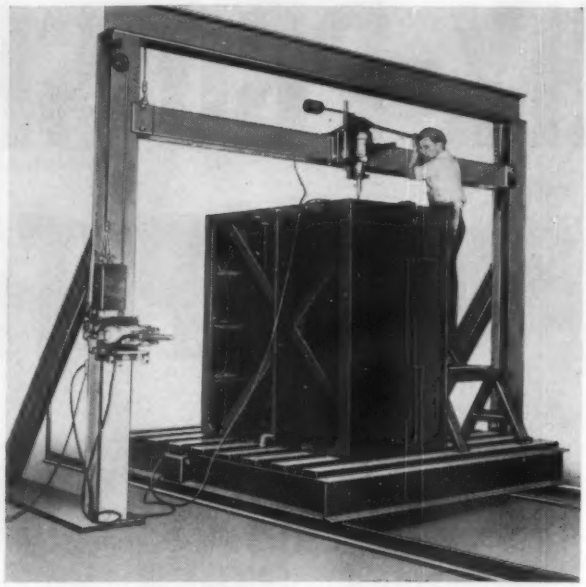


Bench-Model Welding Positioner For Smaller Fabrications

P&H WP-1 welding positioner, designed for use as a bench model for faster production of smaller fabrications, weighs 100 lb, handles weldments up to 500 lb.

With its 24-in. table in horizontal position, it stands 15⅞ in. high. Rotation of turntable can be done manually, or with electric-motor drive. Motorized positioners are equipped with an electronically controlled, ac motor drive which rotates table at speeds from 0.18 to 4.47 rpm in infinite stages. Tachometer can be furnished as optional equipment to show rotating speed. Table can tilt a full 135° from horizontal without weldment striking positioner, making it easier to reach difficult spots.

Harnischfeger Corp, Welding Div, Milwaukee 46, Wis



Drilling, Tapping Machine Handles Large Castings

This drilling and tapping machine, specially designed for large weldments and castings, operates on rectilinear coordinates so straight rows of holes can be drilled and tapped on horizontal or vertical surfaces quickly.

Electrically operated dolly has a load capacity of 10,000 lb and is equipped with a remote jogging switch. The frame which supports the drills can be free-standing or attached to existing structural members. Unit illustrated will handle pieces up to 12 ft. wide; height is limited by headroom available and length by length of dolly rails.

Machine will drill and tap holes up to 1-in. dia. in steel. Drill units are interchangeable and can be furnished with manual, pneumatic, or hydraulic feed.

L A B Corp, 113 Highland Ave, Skaneateles, New York

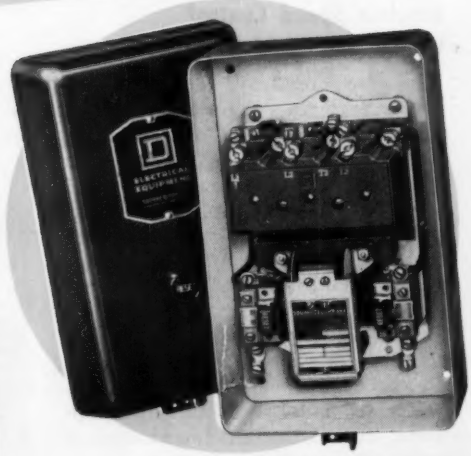
Balance is important in MOTOR STARTERS, too!

Only Square D Balanced Design Gives ALL the Features without sacrificing Any One!

EASY INSTALLATION. Plenty of wiring space with *no sacrifice of compactness.*

SIMPLE MAINTENANCE. Coils, contacts, interlocks, overload relays easily changed without disturbing external connections. Normal maintenance made still easier with standardized parts kits. No complicated identification, ordering or stocking.

FLEXIBILITY. A wide range of special requirements can be met in the field, using standard starters and parts kits available from local distributor stock.



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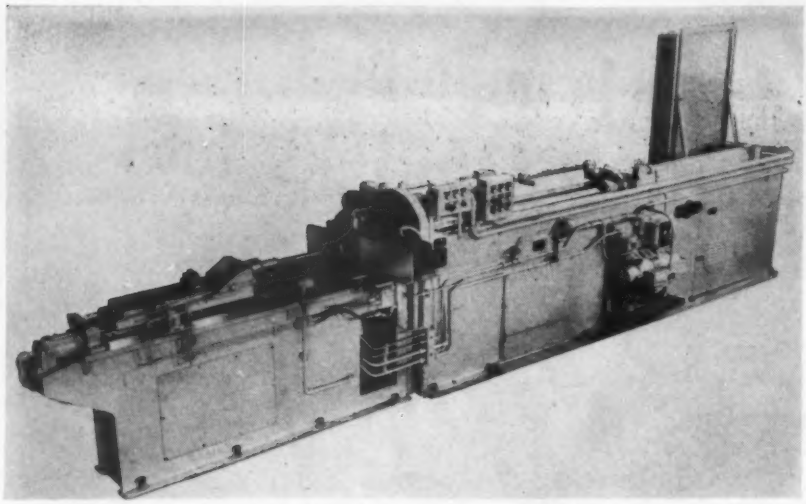
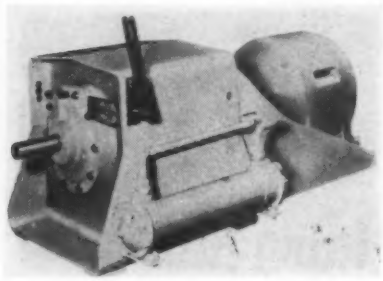
ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY



LAMINATED ROTORS for electric motors have their ID's broached on this automatic horizontal broaching machine with electrical controls. Sliding fixture with split V's is used to position and clamp part. Broach carrier and clamp mechanism is interlocked to machine cycle. Following broaching stroke, drag link in carrier returns the fixture to alignment with chute. Step cycle then moves carrier forward to pick up broach and return it to starting position. Universal chute, which can be adjusted in size, feeds the parts to fixture. Operation of cycle is completely automatic—*American Broach & Machine Co, 415 W Huron St, Ann Arbor, Mich*



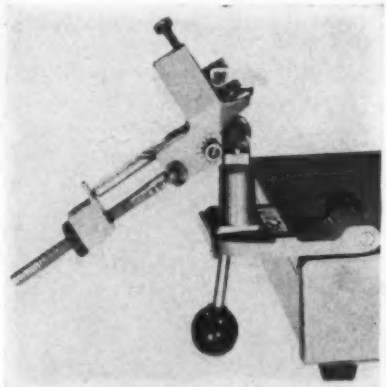
Stepless Speed Control With Gyrol Fluid Drive

Line of enclosed self-contained fluid drives featuring stepless speed control, no-load starting, and excellent torque-limiting control is available from American Blower. Designated Type VS Class 2 Gyrol Fluid Drive, units are offered in wide range of speed adjustment on both variable and constant torque loads, and are designed for dual rotation.

This drive permits the motor to come up to speed under practically no-load conditions and allows simplification of motors and starting equipment. Units will limit the amount of overload torque which can be transmitted to the load with torque-transmitting capacity adjusted by positioning speed control lever. Rate of movement of same lever governs acceleration rate. Type VS Class 2 is readily adaptable to manual or fully automatic control.

The drive is available in six sizes from 7½ to 800 hp for operating speeds up to 1800 rpm. The welded steel housing serves as an oil reservoir, as well as an enclosure for the rotors, bearings, oil circulating pump, and speed regulating scoop tubes. Choice of control lever or handwheel for scoop-tube positioning is optional. Automatic control devices can be adapted as required. Oil coolers are required with all adjustable fluid drives. Water type oil coolers are standard with the new units.

American Blower Corp, Detroit 32, Mich



Drill Sharpening Kit

The Swanson drill sharpening kit includes drill grinding attachment, rocker plate, metal base, three-way drill point gage, and instruction manual. The drill grinding attachment holds the drill in sliding V-block, accommodates twist drills from ⅛ to ¾ in. Parts include: micro-adjusting nut, follow-up block, V-block setscrew, drill clamping screw, hold-down block, lip positioner adjusting screw, lip positioner tension spring, adjustable lip positioner, and clearance angle screw with indicator plate.

The rocker plate includes drill size gage plate, gage plate setscrew, and rocker plate handle. The metal base, 12x10¾x3 in. is finished in hammertone baker enamel. The Swanson 3-way drill point gage, made of nickel-plated metal is only 4 in. in length with calibrations and moving angle pieces.

In use, bench grinder is mounted to base according to instructions. Kit has been designed for 6-in. bench grinders with wheel spread up to 15 in., and 5 to 5⅜ in. from base to center of spindle. Rocker plate enables the user to shift the drill back and forth between the up and down strokes while regrinding. Complete kit retails at $32.50, FOB Evanston.

Swanson Mfg Co, 1236 Sherman Ave, Evanston, Ill

Magnaflux Electronic Device Measures Depth of Cracks

Magnaflux announces the Sedac SE-100 seam depth indicator which can nondestructively both detect and measure the depth of cracks in iron and steel. It is a portable electronic instrument whose sensing element is a scanning probe on a 10-ft cable. It will locate and measure depth of defects from 0.012 to 0.120 in. deep. Larger cracks are detected, but their size is not measured. The unit can be used on flat pieces and curved surfaces with 3½-in. or larger radius.

The Sedac is already equipped with circuits for completely automatic operation. Only seams deeper than the pre-selected minimum are found, and this automatically energizes a reject relay which marks or removes the part in question.

Magnaflux Corp, 7300 W Lawrence Ave, Chicago 31, Ill

Tube Makers Please Note —

A tube mill represents a major investment. Good business practice dictates that before you invest—you should investigate.

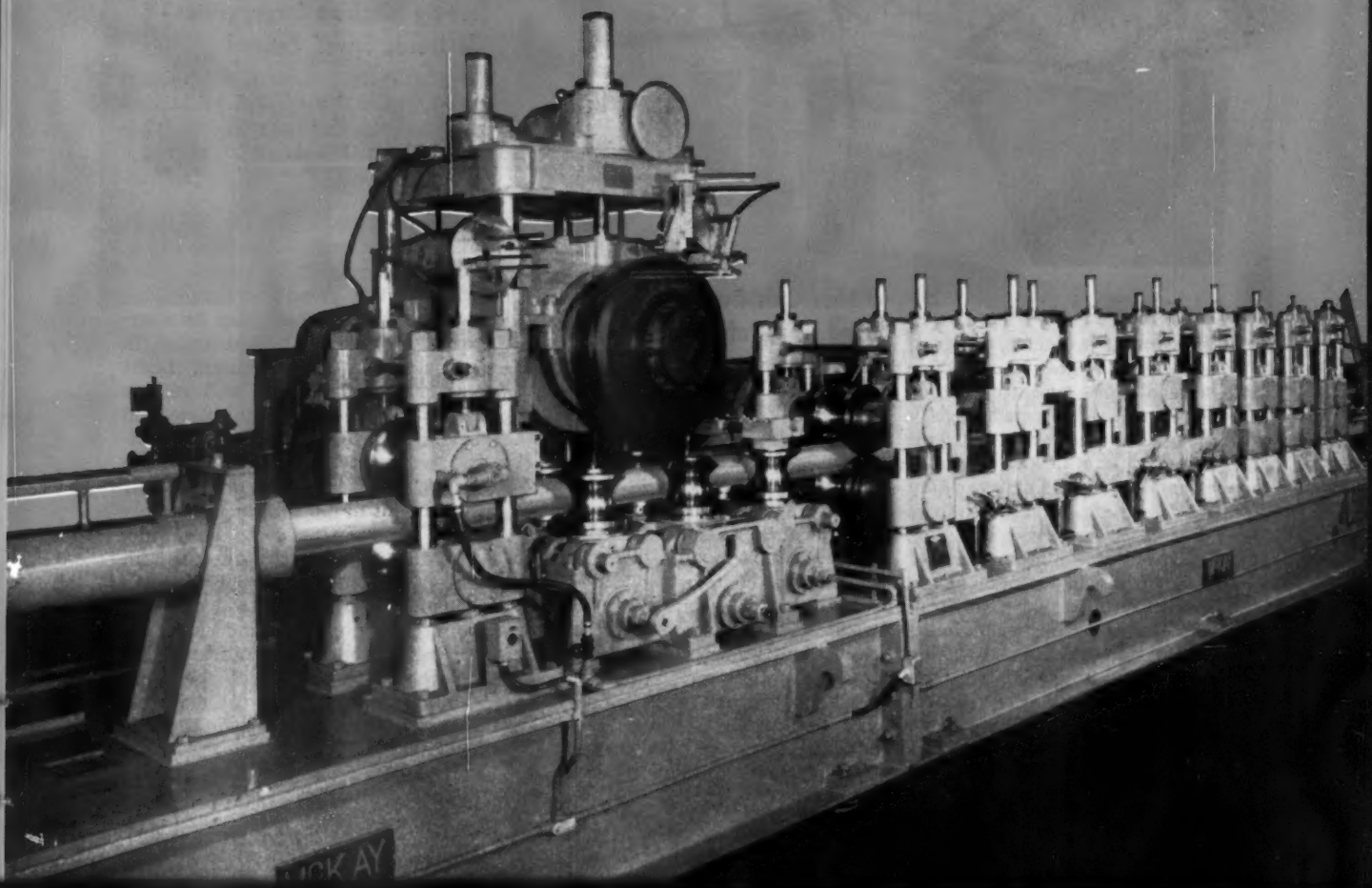
We here at McKay believe we build the finest tube mill made today. We could point to many features that support this belief. However, these features are all a part of our determination to constantly improve the product, and to *never substitute for quality.*

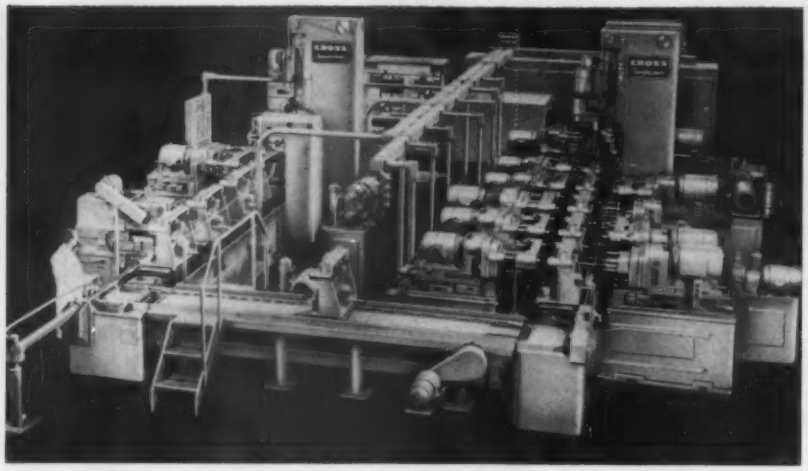
Experience has proved the most expensive single item in tube mill operation is *down time.* This time lost can quickly mount into thousands of dollars — making any savings in the initial cost of equipment trivial by comparison.

Every McKay Tube Mill is designed to deliver the ultimate in PERFORMANCE, PRECISION, RUGGEDNESS and SAFETY. Compare! Investigate thoroughly before you buy and we feel sure you'll specify TUBE MILLS by McKAY.

THE McKAY MACHINE COMPANY, *Youngstown, Ohio*

Designers and builders of modern tube making, forming, sizing, reducing, welding and cut-off equipment.





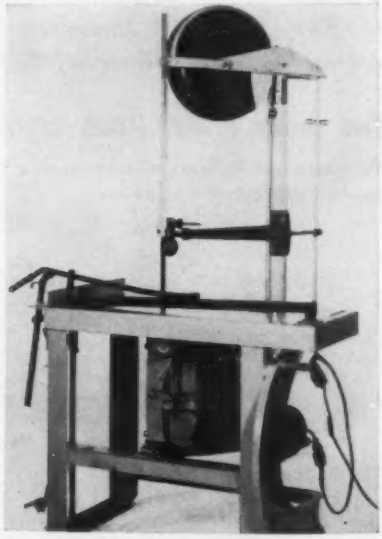
FLYWHEEL HOUSINGS for both standard and automatic transmissions are machined on special Cross unit which performs 139 operations on 170 pieces per hour. Because parts are irregular in shape, special workholding fixtures are provided with parts clamped by hydraulic power wrenches. Pallets transfer automatically from station to station. Ways are hardened and ground. Hydraulic feed, rapid traverse, automatic lubrication, and conformation to JIC standards are other features—*The Cross Co, Detroit 7, Mich*

Swedish Contour Projector

The Nife contour projector, designed in Sweden for laboratory work, eliminates need for special contour charts. Images are projected directly to large ½-in. thick heat-resistant glass screen, and enlarged drawings can be made by draftsman working directly on screen. Direct readings are taken with enlarged drawing, glass scale, or table micrometer.

A wide variety of accessories extends the usefulness of the projector. In addition to special built-in angle-measuring vernier, focusing handwheels, and 3-way control panels, a surface illumination unit is offered for the study of blind holes.

Imported by Nife Inc, Lambert Ave, Copiague, LI, NY



Gibbes Unit Doubles As Band or Cutoff Saw

Metal-cutting saw, which operates as a band or cutoff saw, known as the Gibbes-Kennedy, splits, notches, slots, saws contours, and performs cutoff operations. Table-mounted, it is detachable for portable cutoff use.

The saw column is designed to pivot around the cutting edge of the blade for a 14-in. cutoff clearance or a splitting clearance with 15½-in. throat. Saw is fed into the work, or work is fed into the blade. Operator can adjust upper saw guide during travel to follow scribed line through hard spots in materials. Blade feeds into work at 90° to plane of table and direction of cut throughout the feeding traverse, allowing stock removal and re-entrant cuts for notching and slotting. Materials vise locks over work with hand pressure. Blades are changed in 3 min with work in position on table.

An automatic pressure-sensitive clutch eliminates jamming and machine damage. Operator selects automatic operation or foot-pedal control, power or hand feed. Unit weighs 365 lb complete with table and is powered by 1/3 or ½-hp motor. It has 3 cutting speeds. Optional attachments include rollers, portable vise, and gravity-fed coolant system.

Gibbes Machinery Co, Dept 5, Columbia, SC

Honing Machine Incorporates Electronic Speed Control

Electronically controlled spindle speed on the Staple Model 5 honing machine supplies infinitely variable speed from 160 to 1600 rpm for honing ID or OD's ranging from ⅛ to 1 in.

Spindle speed is varied by small lever switch mounted in front of operator and may be increased or decreased while spindle is rotating. A long foot pedal which may be operated by either foot is mounted in center of machine column. Light pressure on this pedal will release the brake, start spindle to rotate, and feed the honing stones out to an adjustable, preset stop. Releasing the pedal will retract the stones, cut off the current to the spindle, and apply brake for stopping spindle rotation.

Two swinging doors, one on each side of the machine column, have racks for holding the various sizes of tools. Coolant pump and tank are also assembled in the column.

Seven different model tools are supplied for use in the No. 5 machine, five for ID work and two for OD.

Staple Engineering Co, Birmingham, Mich

10 cold-finished
JALCASE
grades
J&L
STEEL
MEMORANDUM
Here's another new book
by J+L...you'll want it for
your reference material
NOTE:
Data on J&L's Jalcase include information on the superior machinability of this cold finished steel. Both speed of machining and the amount of metal removed per revolution can be substantially higher than with other steels of approximately the same mechanical properties.
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You can help us place a copy of this *new* book in your hands. Please give us your name and address. We'll do the rest. It will be *mailed* without cost to you—no intrusion on your time.

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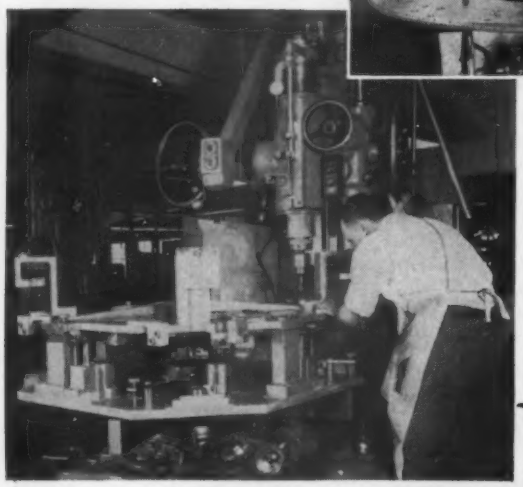
Now Available at B. Jahn

TOUGH PROJECTS OR PRECISION PRODUCTION DELIVERED TO SPECIFICATIONS . . . SCHEDULES!

PERHAPS . . . YOU NEED THIS

Master fixture for jet aircraft with bushings fitted to multiple holes to .0005".



OR THIS

Huge radar housing fixture with over 200 individual holes — each held to ten-thousandths accuracy.

WHATEVER YOUR JIG BORING REQUIREMENTS, REMEMBER—B. JAHN'S MASTER TOOLMAKERS, WORKING ON 16 UP-TO-THE-MINUTE JIG BORERS, SPECIALIZE IN SOLVING INDIVIDUAL TOOLING OR PRODUCTION RUN PROBLEMS. DISCOVER THE TIME, TROUBLE AND MONEY B. JAHN JIG BORING SKILL CAN SAVE YOU.

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THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

ROUND TABLE *Discussion*

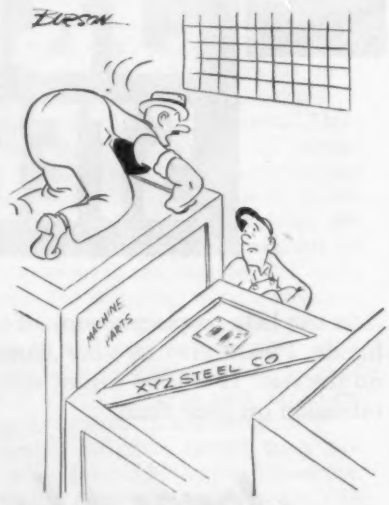
SLIDE-RULE FOREMAN

Does the engineer, appointed shop foreman, have a strike against him in the men's eyes? Will they resent the fact that he hasn't worked up from the ranks? Can he make a good foreman?

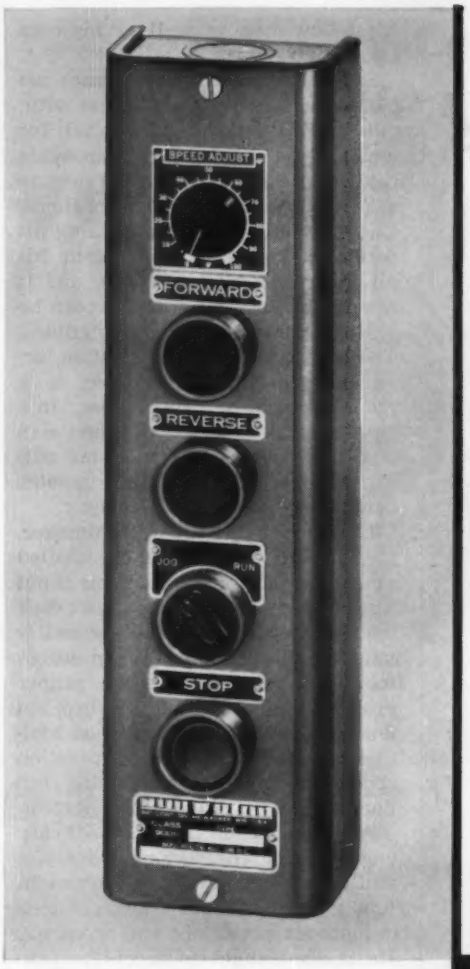
IN A SMALL OR MEDIUM-SIZE PLANT, the engineer is using the foreman's job as a stepping stone. An ambitious engineer is not satisfied with the foreman's status on a permanent basis. His sights are aimed higher. He can and will do as well as any other man in a shorter time. Under normal conditions the man in the shop requires ten to fifteen years to develop himself for the foreman's position.

An engineer coming out of college only needs three to five years. If he has this experience from another plant in a similar field he can step up immediately. He will be satisfied for about five years absorbing knowledge and experience, then will start looking around for greener pastures. This will be the same position with a larger company or a step up the ladder, not only in position but financially.

The engineer does not spend four of the best years of his life with his nose stuck in complex technical books, working during his vacations and selling out hard-earned dollars for tuition to learn to be a foreman of a department. His aim is to make this world a better place to live for



"Moodler, I know you're the bashful type . . . but it's quitting time!"



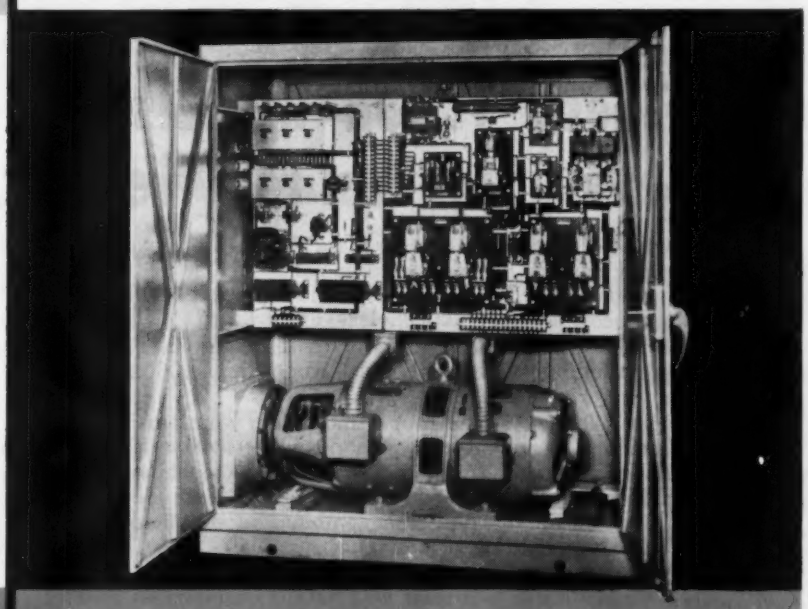
The "Unseen Hand" at the Controls . . .

AUTOMATICALLY SENSITIVE

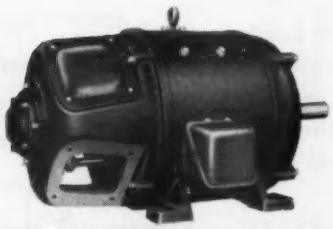
Performance-Rated©

Century SELECTIVE SPEED DRIVE

More accurately than the most experienced operator, Performance-Rated Century Selective Speed Drives *automatically* adjust motor speed to meet operating requirements. Speed changes are integrated with varying pressure, temperature, viscosity or size of the material being worked. You can also use Century Selective Speed Drives for starts, stops and jogs—forward or reverse—as required.



For full information and assistance on any motor drive application, AC or DC, call your nearest Century Sales Office . . . or write us direct.



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1/8 to 400 H. P.

CENTURY ELECTRIC COMPANY

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ACCO products

Wilson "Tukon" Micro Hardness Testers

A model for every range of pyramid testing
Model LR—Floor model for Micro and Macro Hardness testing
Model FB—Floor model for Micro Hardness testing only
Model MO—Table Model for Micro Hardness testing only

These "Tukon" models meet every fine test requirement

• WILSON "TUKON" Micro Hardness Testers are unexcelled for testing metallic and non-metallic parts such as fine wire, small precision parts, thin metal, shallow superficially hardened surfaces, jewels, plastics, glass, etc.

The three models pictured cover the entire range of diamond pyramid testing—with both Knoop and 136 degree Diamond Pyramid Indentors.

Proper selection of the proper model for your particular requirement depends on the type and thickness of work to be tested, range of loads, purposes for which the machine is to be used—research or control, other hardness testing equipment available and whether a combination of micro and macro hardness testing is required.

We invite you to consult with WILSON engineers on your hardness testing problem. There is no obligation. Write for **Booklet DH-114** *on WILSON "TUKON" Micro Hardness Testers.*

ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

WILSON "ROCKWELL" and "TUKON" Hardness Testers

his fellow-men as well as his own family.

Since every engineer cannot set out and accomplish his purpose without an investment of capital for which he is entitled to a reasonable return, he must offer his services to a person, persons, or corporations. The individual or company using his services derives a profit from his direct or cooperative efforts, and it is only fitting that the engineer be compensated for his contributions. The engineer with his education, acquiring practical experience, is a potential asset to his employer. In a few years he surpasses the shop man with ten years' experience and still has the capacity to attain greater heights, even the presidency.

He may never be a toolmaker, turret-lathe setup man, or skilled machine operator, because this is not his adopted vocation. He knows each operation even though he personally cannot perform them. He can design tools and even outline the proper procedure for their manufacture, but does not have to be a first-class toolmaker. He can prepare operation sheets for machine operations, but does not have to be a good operator.

At school he is taught the theory and logic of engineering principles and management. He is also taught how to learn the latest developments in methods, materials, and processes. He is also taught to accept responsibility.

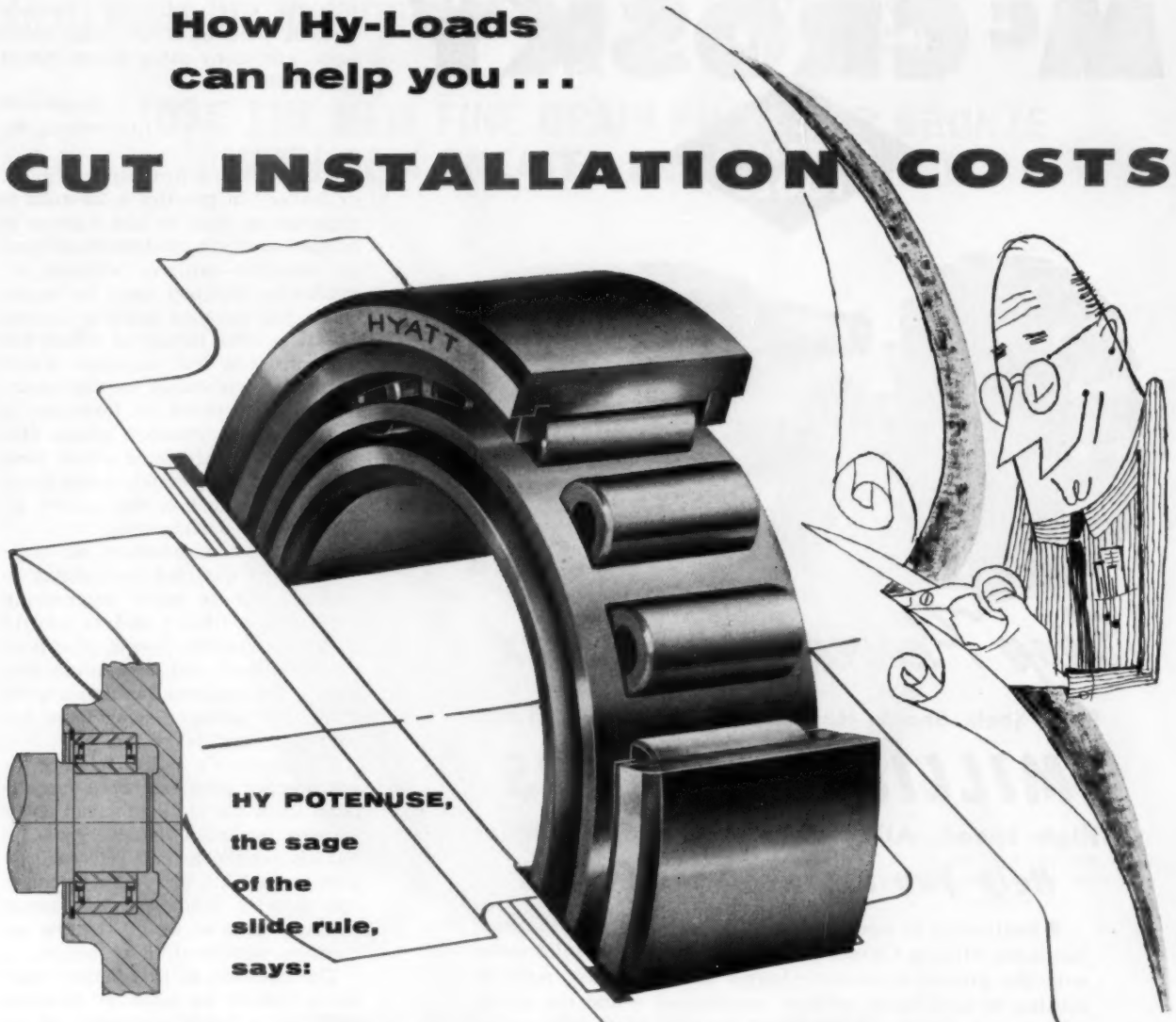
He should be accepted by the shop in the same manner that an apprentice is received. The apprentice has two left feet and ten thumbs when he starts on the job, but three or four years later he is one of the boys. The engineer in three or four years may be the super or VP.

The slide-rule foreman is a ficticious character created by the men in the shop we have in the past in-

"I had it all so delicately adjusted . . . and then along came that damn fly."

How Hy-Loads can help you . . .

CUT INSTALLATION COSTS



You don't need a lot of extra "holding gimmicks" with HYATTS!

YOUR COMPLETE LINE OF CYLINDRICAL ROLLER BEARINGS

Look at this speed reducer, for instance. The inner race of the HYATT Hy-Load is held on the shaft with a heavy press or shrink fit—*nothing more!* No money wasted for end clamps, threads, nuts, screws or washers. And brother, that rotating HYATT race will *never crack or come loose* come h - - - or high water. Know why?

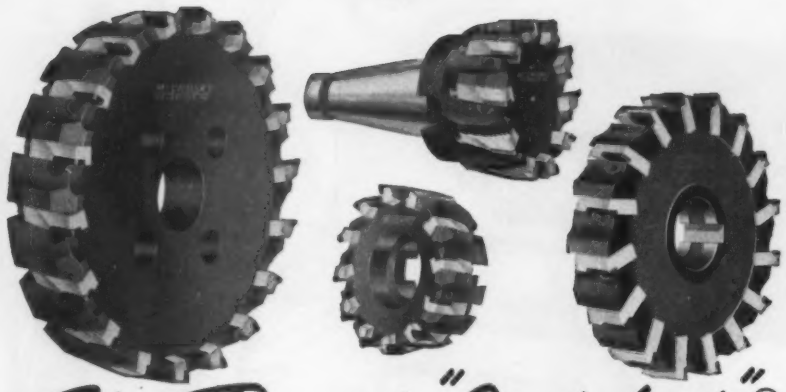
HYATT races are made from low carbon alloy steel which, after carburizing, provides a *ductile core* and *case hardened operating surfaces.* That's why they'll take press fits and shock loads that would be suicide for the through-hardened steel used by other bearing makers. Naturally, it costs HYATT more to maintain the industry's finest heat-treating facilities that make this extra quality possible—*but it sure saves trouble and money for every HYATT user!* Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS

STRAIGHT ○ BARREL ○ TAPER ○

McCROSKY

COST CUTTING TOOLS



Shop Proved "Jack Lock"®

Face, Shell, Shank, Half-Side and Staggered Tooth

MILLING CUTTERS

High Speed, Alloy or Carbide Tipped Blades

Help You Make Bigger Profits

● Engineered to meet modern milling practices—McCrosky Jack-Lock Milling Cutters combine the rigidity of solid tools with the greater economy — longer life — the easy, positive locking of each blade, without hammering — and the quick release and accurate blade adjustment of McCrosky shop-proven nationally recognized Jack-Lock Wedge.

Department superintendents, foremen and operators have found that there's nothing better or cheaper, than McCrosky Milling Cutters. You can't keep competitive with less. Why gamble? *Write for Bulletin 17-M today.*

COST CUTTING TOOLS **McCROSKY TOOL CORPORATION**
MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

Jack-Lock® **MILLING CUTTERS**
Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Cutters. Sizes to 24" in dia.

Super®-Adjustable **REAMERS**
Chucking and shell designs. Proven construction locks blades rigidly, producing smooth, concentric holes.

Special **PRODUCTION TOOLS**
Combine 2 or more related operations into a single tool, producing better products, quicker, and cheaper.

Universal **MILLING CUTTERS**
Bodies can rotate in either direction. Simply using blades of proper hand, angle and cutting material, meets any requirement.

ask us about...

Wizard® **QUICK CHANGE CHUCKS**
Tools are held centered and rigid. Operator can change tools without stopping or slowing down the spindle, increasing production and cutting costs.

Turret **TOOL POSTS**
Successive tools are swung into cutting position quickly, indexed accurately and locked rigidly, giving engine lathes the versatility of turret lathes. 5 styles, 9 sizes.

Block Type **BORING BARS**
Bore more pieces in shorter time, with greater accuracy. Stock sizes with straight or tapered shanks, with or without pilots, for holes up to 15" in dia.

troduced the left-hand monkey wrench, pails of steam, high speed belts, and many other things out of this world.

Frank J Zarnowski
Rutherford, NJ

BY DEFINITION, a foreman is a guide or leader. In practice a foreman is expected to guide or lead a group of humans toward a predetermined goal or objective—with or without scientifically designed tools or equipment. The foreman deals in human equations—the factors of which are not constants, but variables which cannot be established by mathematics to be recorded as formulas in handbooks or reference tables. Human behavior problems which need to be solved immediately many times during a production day cannot be solved with a slide rule.

By popular assumption, an engineer is one qualified by training to analyze and to solve engineering problems—to direct and to control forces by scientific means, according to established and recognized formulas. The engineer can do his work in relative privacy, away from human grips and bickering.

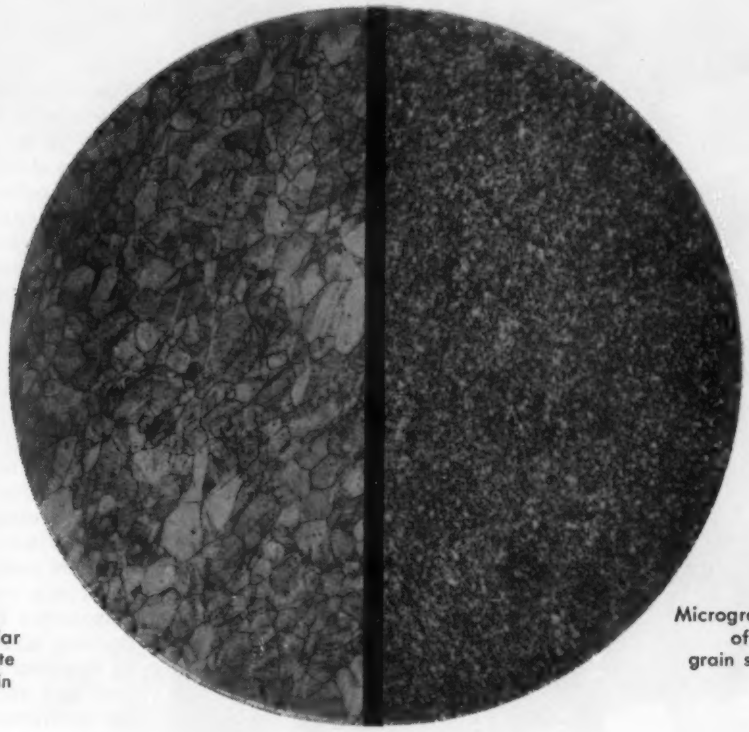
The engineer's ability to solve his engineering problems does not depend upon his ability to lead other humans toward a definite goal. He has his handbooks and reference tables to back up his decisions; he is not directly influenced by human behavior such as would require immediate consideration or action.

The question as to whether engineers should be used as foremen calls for a flexible answer. If we have a good leader, without or with engineering training, we could have a good foreman. The good foreman with engineering training could be a good engineer, but a good engineer without leadership qualities would not necessarily be a good foreman. A good engineer with

"Goofed again, Kelly?"

Get longer life in formed parts AT NO EXTRA COST

USE THE NEW FINE GRAIN PHOSPHOR BRONZE WITH 30% GREATER ENDURANCE LIMIT



Micrograph (75x magnification) of regular phosphor bronze. Note relatively coarse grain structure.

Micrograph (75x magnification) of Duraflex. Its fine grain structure is the secret of its superiority.

DURAFLEX*

BY ANACONDA

DURAFLEX is a new, fine-grain phosphor bronze developed and sold only by Anaconda. Comparative fatigue tests show that the endurance limit of DURAFLEX is approximately 30% higher than for regular phosphor bronzes. In surface appearance, surface smoothness and hardness, it is superior to other phosphor bronzes. It is unsurpassed in corrosion resistance by any other phosphor bronze. Further, its formability is increased with no sacrifice in yield strength. DURAFLEX is a *premium* phosphor bronze in every way except cost; there's *no increase in price.*

If you're now using a hard-temper phosphor bronze, chances are that you can do the same forming in extra-hard temper DURAFLEX.

If you're looking for longer life in the parts you form, we'll be glad to send you a free sample of DURAFLEX. Try it, test it, and you will agree that it is superior.

*Trade Mark

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AN

ANACONDA®

PRODUCT

MADE BY THE AMERICAN BRASS COMPANY

FREE SAMPLE

The American Brass Company, Waterbury 20, Conn.

(In Canada: Anaconda American Brass Ltd., New Toronto, Ontario)

Yes, we'd like to try DURAFLEX. Please send us a free sample of

sheet in_____ temper,_____ thick,

wire in_____ temper,_____ diameter.

☐ **We'd like to talk to one of your representatives about DURAFLEX.**

NAME.....

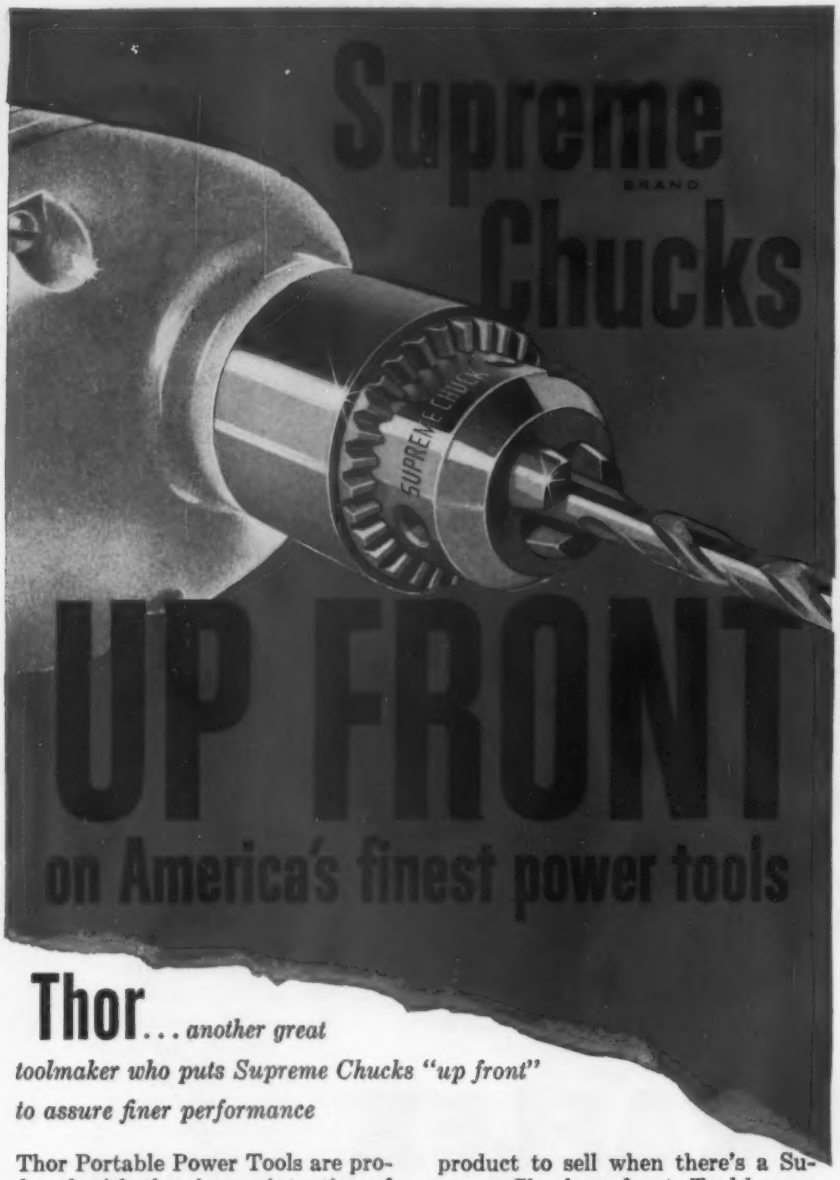
COMPANY.....

STREET.....

CITY..... STATE.....

SHEET . . . up to 0.062" thick

WIRE . . . up to 3/16" diameter (approx.)



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Thor Portable Power Tools are produced with the sincere intention of giving America's tool buyers the finest performance qualities possible. With this in mind, the management has elected to equip more and more of their output with Supreme Brand Chucks.

Thor, like other power tool makers, have found that they have a finer product to sell when there's a Supreme Chuck up front. Tool buyers everywhere will do well to follow the leaders and specify Supreme on new tools—insist on them for all replacement use.

An industrial distributor near you can give you the full story on extra quality Supreme Brand Chucks.

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leadership qualities could be a good foreman, but, with this combination such a man could be used to better advantage by management, although a short stint at being a foreman would enhance this man's training—giving him a better conception of the foreman's problems, which understanding might influence his views regarding the problems of production.

Henry George
Dayton, Ohio

THE PROBLEM of the engineer as a foreman is a pertinent one. However, it is impossible to make a blanket statement that it is a good or poor policy to select new foremen from the engineering department. It is not so much a question of the man's experience or schooling, or whether he has shop knowledge or technical know-how, as it is a question of his inherent ability. You cannot advance a man to the position of foreman and then forget about him. It takes training and guidance to make him a foreman. The thing to remember is that you do not select a new foreman—you select a candidate or a trainee for the position.

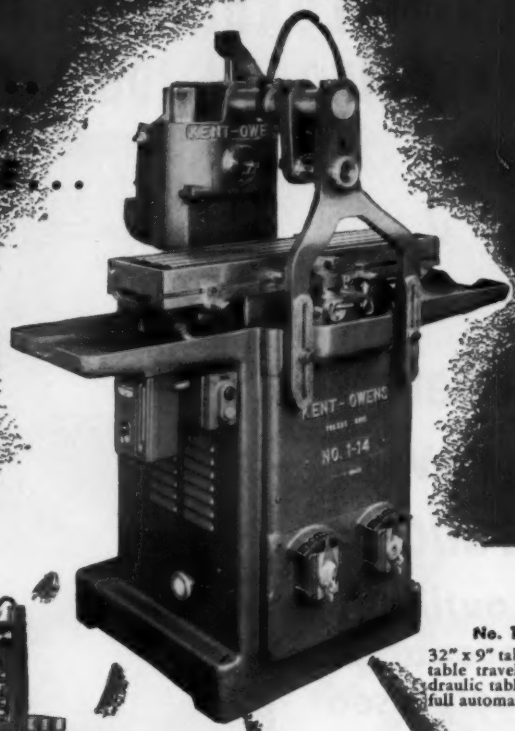
In the past the position of foreman covered a very wide field. He was responsible for hiring, timekeeping, training, and human relations as well as engineering, inspection, production and repairs. For many years the ever-growing size of this assignment went unnoticed. The pressure of competition and the complicated specialization of production served to open the eyes of management to just what the foreman was doing and his importance to the functioning of the plant.

Today the functions and responsibilities of the foreman are more highly specialized and better organized. With responsibility of the foreman focused upon the three im-

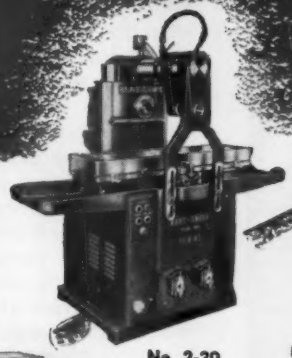
"Oh - - Oh . . . Pete - - I forgot we were having open house today . . . that's my wife. Stall 'em til I get this art gallery down . . . !"

EXTRA RUGGED . . . SPEEDY . . . ACCURATE . . .

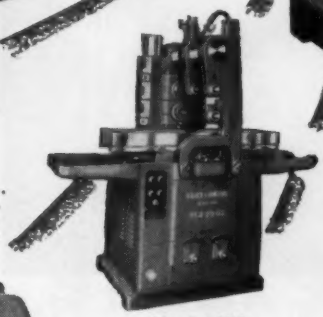
to Bring Down Milling Costs!



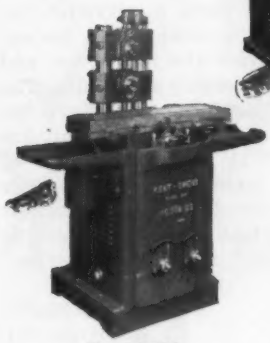
No. 1-14
32" x 9" table ... 14" table travel . . . hydraulic table feed . . . full automatic cycle.



No. 2-20
20" table travel... 42" x 12" table.. fully automatic hydraulic table feed.

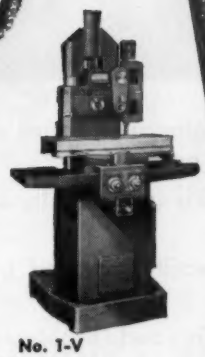


No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel . . . 42" x 12" table.

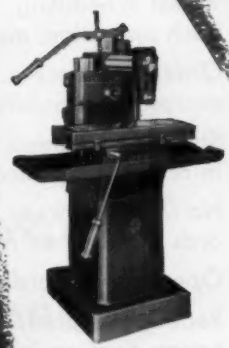


No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

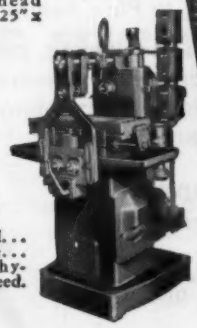
No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.



No. 1-V
Hydraulic vertical head feed ... 5¼" head travel ... 25" x 9" table.



No. 1-M
Hand feed to table and head ...25" x 9" table ... Adjustable head counterbalance.



No. 1-8
8" table travel... 25" x 9" table... automatic hydraulic table feed.

STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout these rugged machines make the difference . . . greater dependability . . . accuracy maintained in meeting tough production schedules. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #754 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, O.

KENT-OWENS
for milling machines

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...outlining procedures widely used for these cost-cutting results:

Visual Scheduling . . . a glance at board shows work ahead for each operation, machine or man.

Order Sequence . . . quickly indicated by arrangement of tickets representing orders.

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No Delay Between Planning and Dispatching . . . no lists or records to write or revise.

Operation According to Plan Assured.

Readily Adapted . . . to planning, production, assembly, maintenance, engineering and work of every variety, using work orders, time tickets, move tickets, tabulating cards, etc. and McCaskey Machine Control Boards.

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Please send me bulletins describing McCaskey Machine Loading, Scheduling, Dispatching and Job Assignment.

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portant phases of plant organization, namely, production, training, and human relations, the old time "straw boss" becomes in reality a supervisor, and with better supervision has come development of the worker, improved morale, and increased production.

The foreman in the enlightened plant of today is really an industrial manager. His functions differ from those of the higher executive staff only in the matter of scope. In view of this explanation of the position of foreman, the length of service, loyality, or technical knowledge of the product cannot be the fundamental basis for promotion to the position of foreman. In selecting candidates for foremanship, it is vital to pick for further training those who stand out in physical stamina, emotional drive, and creative intelligence.

The functions and the responsibilities of the foreman are many and varied. A high level of intelligence is essential. Good supervision requires that the foreman set the objective, provide the incentives, and develop the workers under him. The foreman, therefore, must have the analytical approach and the quality of vision that will permit him to meet these higher demands. Whether or not the candidate is an engineer or a shop man is only one of the many factors which must be considered.

William Martin
Brooklyn, NY

EVIDENTLY, Ed is just where he was back in his apprenticeship days. He is biased against any form of progress and a man who can play a slide-rule solo is, in his estimation, no better than a dolt who tries to show off. He has about as much use for one of these men as a cat has for a locomotive.

There are firms where a man who enters the engineering department, if he has the makings, is occasionally promoted to the position of foreman

"Good heavens! I've run out of gripes!"

You get the machining qualities you want when you use J&L's LEADED STEEL BARS

1. FASTER MACHINABILITY . . . because with J&L's Leaded Steels much higher cutting speeds are possible.

2. INCREASED TOOL LIFE . . . because the lead addition in J&L's Leaded Steels lowers the coefficient of friction—thereby reducing the heat that develops in the cutting edges of tools.

3. IMPROVED SURFACE FINISHES . . . because J&L's Leaded Steels machine to fine surface finishes.

4. LOWER OVER-ALL COSTS . . . because the free-cutting qualities of J&L's Leaded Steels boost production and, at the same time, reduce part rejections.

Phone the J&L District office or Warehouse nearest you.

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PRECISION RIVETERS
TAKE THE TOUGH JOBS
High Frequency IMPACT with Spinning
Airflex® Riveters bring an entirely new technique to the field of fastening. Riveting now becomes feasible under conditions that previously made it impractical.
Wherever tolerances or riveting pressures are critical, or assemblies and materials are apt to distort or fracture, the Airflex® cold-flow principle has provided the solution. Selective tolerances as close as .002" between peened end of the rivet and the material are being maintained even on volume production. Materials impose no limitations—glass, ceramics and plastics can also be riveted economically. Capacity for steel rivets range from 3/32" to 1". Silver, aluminum, brass, copper, titanium rivets also—hollow or solid—from 1/16".
Airflex® Riveters can give you faster, better riveting on routine jobs—and the economy of riveting on the "impossible" jobs. Write now for complete information.
AIRFLEX® PRINCIPLE combines high frequency blows with a spinning action to cold-flow the rivet. Force and rate of impacts, duration of impacts and spinning speed are independently controlled. Operator training is cut to a minimum.
LEMERT ENGINEERING CO., INC.
191 E. JEFFERSON ST., PLYMOUTH, IND.
Airflex®
RIVETERS DIMPLERS

and he is allowed to progress to a higher station as rapidly as he can do so.

They have found that many times a promotion may broaden a man's ideas, and he is usually in a position to meet his men on a common level without obliging him to overlook the fact that he is the foreman and as such, his dealings and relations with them naturally cause them to assume their proper grades.

Ed makes light of the engineers and the engineering profession, yet it has been found that these men may often require more exact work, or at least better finished products as they come from the production line.

As this situation naturally will be one of discretion, it may require a lot of artful handling.

While it may be true that there have been cases where a man from an engineering department has been made a foreman, his head may have had a tendency to increase in size and he may try to show off, but usually his engineering work has broadened his intellect to such an extent that, while his shop experience may be little or none at all, he will be able to learn rapidly.

A specific case may be considered.

A young man was moved from the engineering department to an assistant foremanship in the plate and sheet shop. After a term of two years, he decided to go into business and so he bought a boiler-making plant of small capacity. He found that he had a lot to learn, but he made such good friends with his men that he could ask any question and they would give him a correct answer, without any horseplay.

One of his first bits of information was learning how proper riveting

"Otherwise I can't find a thing wrong with it."

WESTERN UNION TELEGRAM
PITMAN ARM TAPER SERRATIONS BROACHED & SWAGED IN SINGLE
OPERATION ON 35 TON COLONIAL ASSEMBLY PRESS. 32 INTERNAL
(36 INDEX) SERRATIONS, STARTING IN 1.005" ID HOLE, BROACHED
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PRODUCTION RATE 125 PER HOUR. WORKING SPEED 8 FT/MIN.
STRIPPER PLATE HOLDS PART WHILE BROACH RETURNS AUTOMATICALLY.
DEPTH OF SWAGE & TAPER SERRATION ACCURACY CONTROLLED BY
ADJUSTABLE GUIDE BAR STOPS. THROAT OPENING REINFORCED BY
EXTERNAL STRESS BARS TO MAINTAIN ACCURATE ALIGNMENT AT ALL
OPERATING LOADS. REQUEST BULLETIN PA-52.
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Note—Broach and Swage in one operation
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PIONEERS OF H.S.S. BROACHING
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UNIFIED BROACHING is the key to successful broaching

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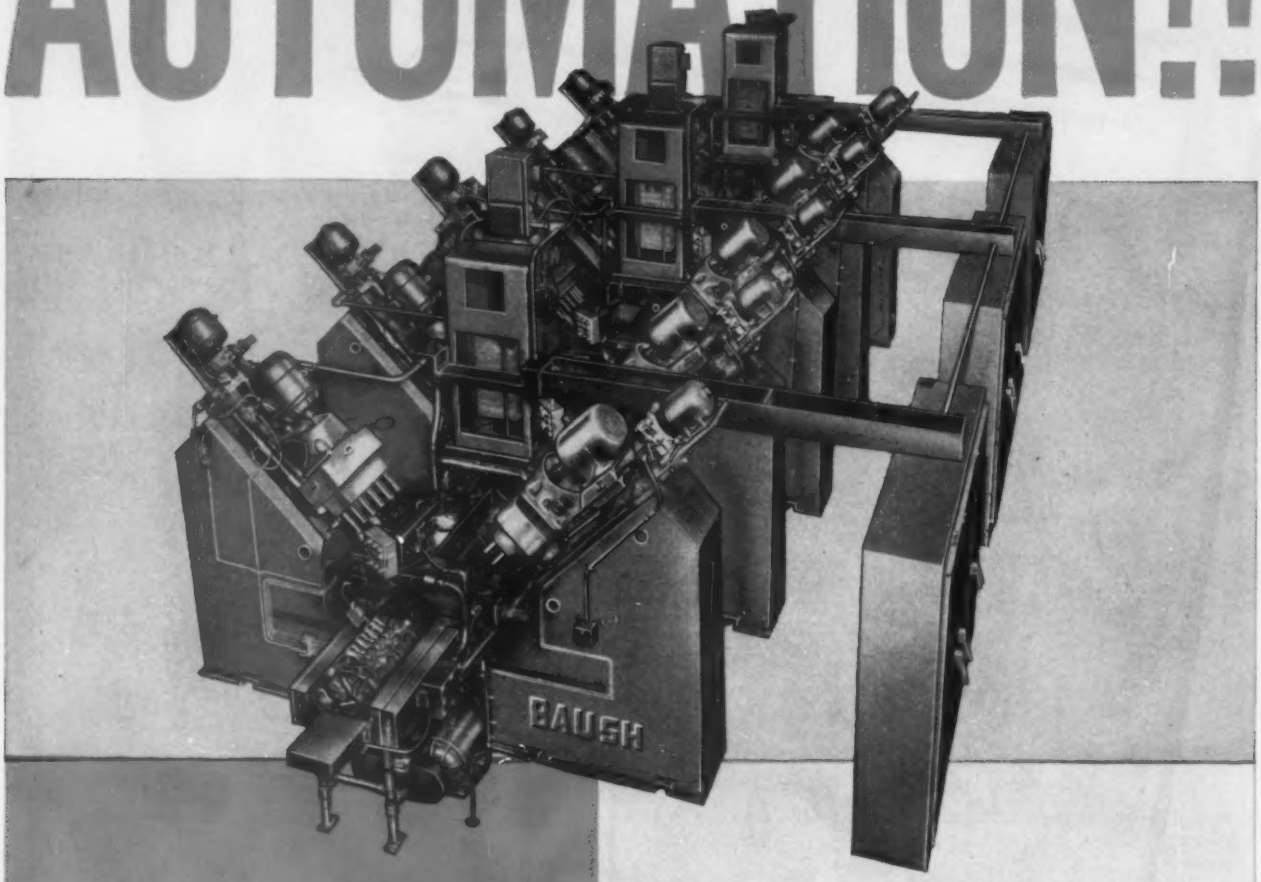

BAUSH 6-Section Transfer with 27 Stations Automatically Performs 9240 Operations on 69 Automobile Cylinder Blocks Every Hour!!!

BAUSH
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SPRINGFIELD 7, MASSACHUSETTS

Once again a leading automobile engine maker selects BAUSH TRANSFER EQUIPMENT for efficient and economical production. Noted for their sturdy construction BAUSH TRANSFERS give day-in and day-out production with the very *minimum* of "down time" for maintenance.

This transfer has thirty (30) Baush Model "S" Mechanical Leadscrew units with 18" max. stroke — arranged and mounted on individual columns in vertical, vertical angular and compound vertical angular positions for various operations. It has —

1 Load Station — 12 Work Stations
2 Roll-over Stations to dump chips
11 Idle Stations for ease of tool change or maintenance
1 Unload Station.

Blocks mechanically transfer from station to station and locate and clamp hydraulically at each work station. A total of 134 spindles, drill, chamfer, ream, mill, core-drill and counterbore 69 V-8 Cylinder Blocks every hour at 100% efficiency.

was done, and as time went on, he established a splendid reputation for his product.

A man of the old-school type wanted to order two boilers like those being made there. He wandered about the shop quite a bit, aproached the young man and asked, "Mr Smith, how long have you been making these boilers?"

"About two years. Why?

"Can you drive a rivet so that it is a first class job?

"No," replied Smith, "but I know when a rivet is properly driven."

The old man bought the two boilers from him and never did he regret his purchase.

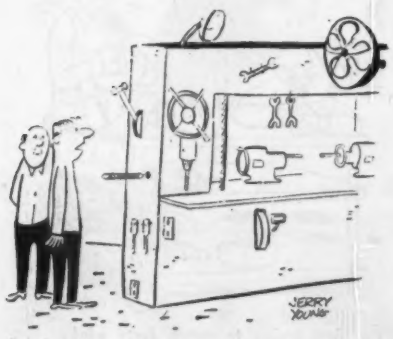
Before the beginning of this century, the men who entered an engineering department were better educated than those men on the shop floor who were operating machines, but today this element of difference is not so evident, for, while a man in engineering may have more book-learning, the well drilled and well informed shop man, is usually better informed about, we'll say, cutting speeds, feeds, and fits of all kinds. But the slide-rule man can, with little effort, outdistance the other in making calculations and can improve himself in these necessary qualifications.

A combination of education and experience is the best way to train a man for the responsibilities of a foreman, but the man who has experience in engineering is the better man.

F H Stebbins
Worcester, NY

WITH AN AB DEGREE in the Humanities, a registered professional engineer's certificate, and a job as a shop foreman I say this. There are engineers and there are engineers. Some can be successful as shop foremen, others cannot.

An engineer is one trained to master the tools, such as mathematics and the principles of science, neces-



"No, I've never seen a more versatile machine in my life."

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NEW!

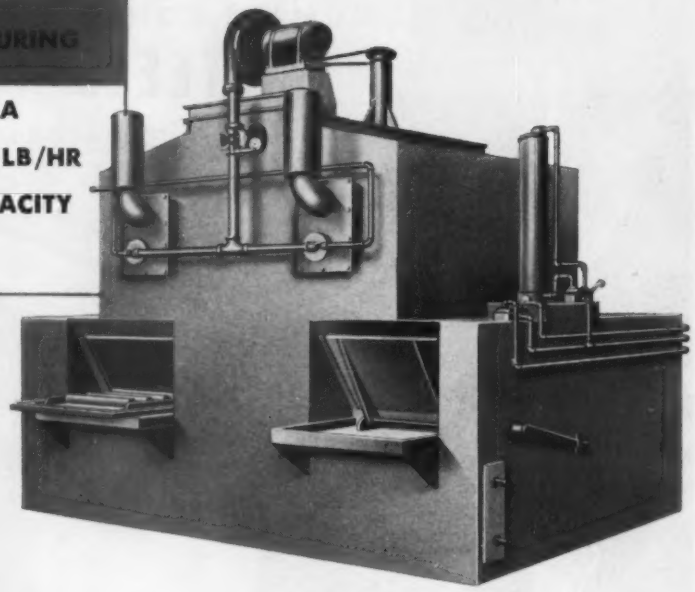
HOLCROFT'S *Bantam-Sized* BATCH FURNACE

FEATURING

A

500 LB/HR

CAPACITY



Holcroft's new bantam-sized batch furnace for controlled atmosphere heat treating does a king-sized job at a low, low cost. An entirely new concept of batch operation, the furnace offers new opportunities not only for small plants, but for large ones which have limited or varied production problems. The new batch furnace offers the same engineering know how and quality that has made Holcroft the leader in heat treat development.

It can be adapted to run such typical cycles as: carburizing; carbonitriding; clean, neutral and bright hardening; carbon restoration; normalizing; annealing; tempering and non-ferrous heat treating.

Operation is simple—only two valves are involved. When the stock has completed its time in the furnace chamber it is lowered by an elevator, transferred into position for quenching, and lowered into the quench oil. Simultaneously, a previously-loaded tray of cold work moves onto the charge elevator and then up into the furnace chamber. The operator may remove the quenched stock from the discharge door or load the furnace through the charge door at any time during the heating cycle.

Quenching is fast and there is no loss of heating time loading or unloading. This arrangement reduces atmosphere gas requirements because vestibule flushing takes place while the stock is being heated.

An important feature of the new furnace is its small floor space requirement. No pits are needed; the heat source is above the vestibule —improving working conditions.

HOLCROFT & COMPANY, 6545 Epworth Blvd. Detroit 10, Mich.

VITAL STATISTICS OF HOLCROFT'S FURNACE

1. **Capacity**—can heat 500 lbs. gross per hour to 1500°F. Flexible enough to be operated at temperatures ranging from 400° to 1800° F.
2. **Dimensions**—9' 3" x 6' 9" x 10' 6" high.
3. **Tray size**—two 24" x 18" pinned sections with basket on each section for loading 9" high.
4. **Operation**—three pneumatic cylinders controlled by two hand-operated valves. Can be made completely automatic.
5. **Quench tank**—completely enclosed with built-in cooling. Hot oil optional.
6. **Fan and Pump**—same size as on Holcroft's big batch furnace. Variable controlled oil flow.
7. **Doors**—hinged at the bottom with operating lever at the side of furnace for greater safety.

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PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

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LOS ANGELES, CALIF. • PHILADELPHIA, PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario • EUROPE: S.O.F.I.M., Paris 8, France

sary to apply the laws of nature to the development of natural resources for the improvement of the material welfare of his fellow man. He is trained how to do things. He seeks knowledge for what use he can make of it. He does not necessarily love the stuff. He enjoys the living he can make with it.

However, most engineers are more than well-trained men. They are usually men of character. They can think. They can discipline themselves. They have respect for the rights of others. They have the capacity to appreciate many things besides science. They have the courage to do what is right when they know what is right. For this reason, if for no other, engineers are great men. I like 'em.

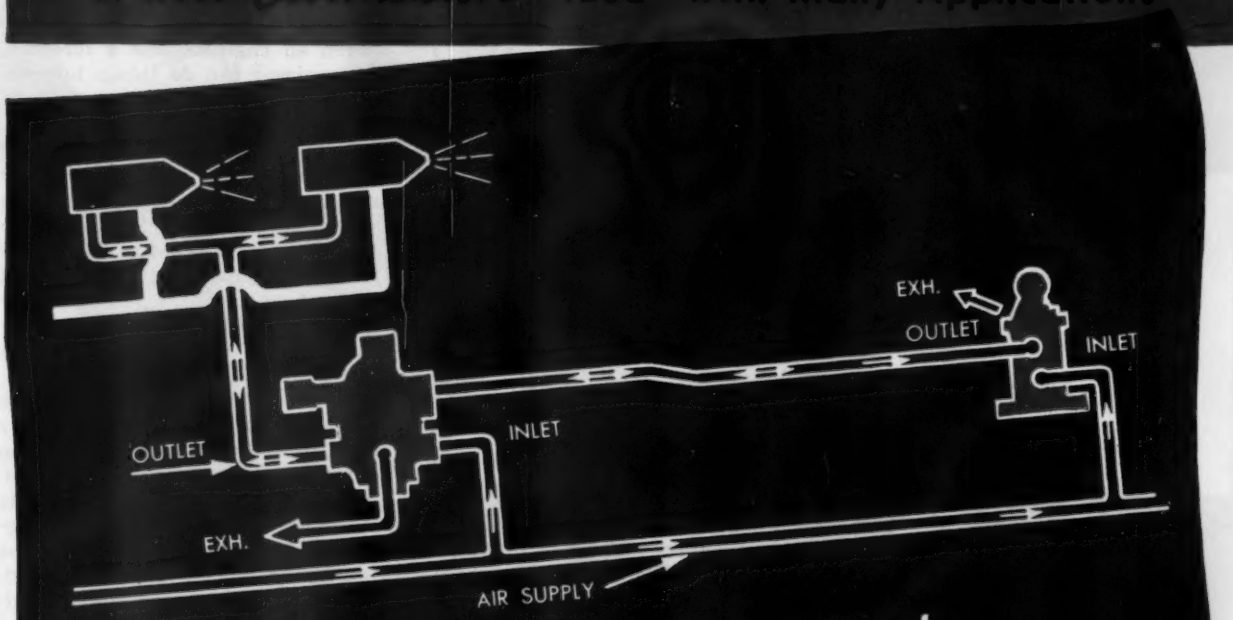
A foreman on the other hand is one who leads men in doing that which is desired by their employee. A foreman must accomplish results through others. He must cooperate and get along with a great variety of people. He deals with the high-pressure executive, fired with ambition and a high opinion of himself, and with the humble, contented, illiterate laborer, putting his son through engineering school. He smiles and he soothes. He agrees and he compromises. He takes it, and just keeps plugging along.

The engineer deals with material things, with material forces. The foreman deals with men. Thus the foreman operates on a higher plane than the average engineer.

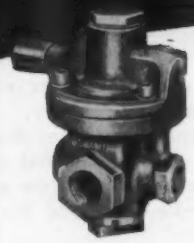
Engineers have weeks and months to perfect their designs. Foremen have eight hours in which to meet a production schedule. A foreman's progress is judged every day; not so an engineer's. Punches aren't pulled in the shop. It is a man's world. The fuzz of the good old col-

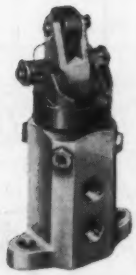
"I'm just trying to catch forty winks . . . can't you guys quit clowning around and saying, 'Scalpel please, doctor.'"

A Ross *Airmation* Idea—with Many Applications



Sprays drawing compound with every press operation





- **Designed for spraying drawing compound on panels before stamping, but adaptable to any application requiring intermittent spraying or air blasting.**
- **Reduces manual work; assures precise quantity of fluid and accurate delivery.**
- **Spray is controlled by a Ross 3 Way Normally Closed WV Sequence Valve which is remotely controlled by a Ross Cam Valve.**
- **Amount of spray time can be varied by adjusting metering stem on valve.**
- **For assistance in engineering this Airmation idea to your application, contact your nearest Ross Service Engineer. He offers practical creative assistance.**

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Ross Control

Ross OPERATING VALVE COMPANY

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to MACHINE BUILDERS, Howell suggests

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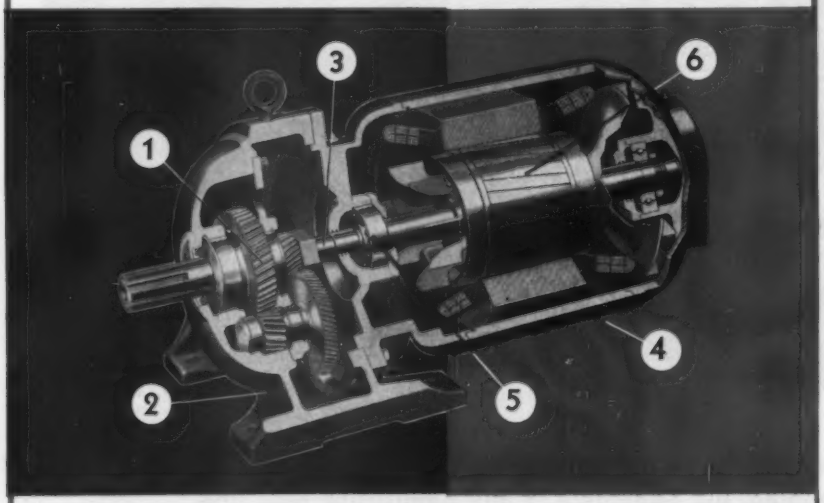
1. **Lifetime gearing.** The wear-resistance of gears depends, in good measure, upon their hardness. Howell's Duti-Rated Lifetime gears have a Rockwell hardness (52-60) substantially higher than the industry average.

2. **Compact, permanently aligned case.** Machine designers like the space-saving compactness of the Howell gear case. Pyramidal mounting puts support where it's needed — avoids the shaft misalignment possible when motor and gears have separate supports.

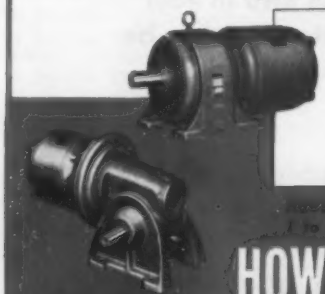
3. **Rugged, solid-shank pinion.** Howell's pinion design, with threaded coupling and self-broaching splines, makes a failure-proof shaft connection between motor and gears. No troublesome keys.



4. **NEMA-standard motors** give machine builders and users complete motor interchangeability, help them reduce inventories and simplify purchasing. Howell gearmotors give you this valuable feature — *with the new re-rated motors included!*

5. **Fully-protected bearings** insure longer motor life. Dirt can't enter Howell's double-shielded bearings either from inside or outside the motor, because they are sealed in the end-plate cavities by dust-tight inner caps.

6. **Copper-clad rotors** mean better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your particular motor requirements. *All* Howell motors have them.



Gearmotors Cut Costs. Actual savings achieved by Howell gearmotors over separate motor-plus-reducer-plus-coupling drives are available for your study. Just request "Gearmotor Savings Table" when you write for catalog.

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1 to 150 hp. Right angle shaft, ⅛ to 40 hp.

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built motors for industry since 1915

HOWELL MOTORS

lege days is never quite rubbed off in an engineering office. Boys are given a chance to group up there.

There is a major difference between an engineer and a foreman. An engineer can do things himself. A foreman must do things through others.

Engineers who are introverts by nature had better stick to their slide rules. Those who are extroverts may, and do, become first-rate foremen. The engineer who likes people, who enjoys being in the midst of the turmoil where plans are consummated, will get along famously in the shop. Such men can take it and they can dish it out.

The ideal way for an engineer to work his way into a shop supervisory position is to first engage in shop engineering—quality control, methods analysis, salvage, inspection. He learns how experienced foremen operate. He gets to know and like the men in the shop. He is accepted. He gets to belong. He acquires leadership.

The shop engineer learns how to handle men, how to get along with a hundred and one characters. He observes how union-management relations are conducted. Respect for those who work by the sweat of their brow grows on him.

The shop engineer offers advice and suggestions gained from his formal education and experience to the shop personnel. In return the shop men give him help, ideas, cooperation, and good will. The exchange is mutual and satisfactory.

The engineer who likes shop work, who likes people, who has a charitable disposition, can throw away his old slide rule any time. He will be

"Just passed the personnel office. Place is jammed full of job applicants!"

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Put life insurance on your forging dies!

The most critical period in the life of a forging die is its first few hours of use. Longer life is assured if adequate and proper lubrication is available during the break-in period.

Treat your dies with 'Aquadag'®—'dag' Colloidal Graphite in water—*before* they are used. This forms a microscopically thin and smooth film which assures necessary lubrication and reduces the need for operational lubricants. Also, it protects the surface against corrosion during storage prior to use. One forging plant increased die life 90% merely by pretreating its steel forging dies with 'Aquadag'.

Superior forging lubricants, either water-base or oil-base, can be prepared by adding a dispersion of 'dag' Colloidal Graphite to conventional die lubricants. 'dag' dispersions provide better parting, improved lubricity, and greater heat resistance; they also reduce lubricant costs, scrap losses, and die failure.

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welcome as a foreman. He will increase the prestige of the foreman's position. We'll go along with that.

Peter A Seward
Swampscott, Mass

THERE ARE MANY MEN who head up big business who know little or nothing about the mechanics of the job. Most of them are successful because they know how to gather around them the men who do know. They are successful because they know how to handle people. Ask any foreman what problems bother hom most. You will find it is not the engineering problems that give him the most trouble. It is people.

Many years ago I was pulled out of the toolroom to head up a grinding department. I was treated rather roughly because one or two grinders wanted that job. I knew very little about the operations or machines. I told the employees I did not know anything about the operation, but that I was soon going to. I told them I needed their help and suggestions. When the operators found out I was not there to throw my weight around, but rather to get cooperation and teamwork, they reacted in the right way. I encouraged them to suggest or criticize. If I was asked a question and did not know the answer I would tell them I did not know, but I would find out. I looked for opportunities to serve the employees and have them serve me. By an understanding attitude and a consideration of faults I found that I was succeeding in winning even the most critical employees over to my way of thinking.

This method will work if you come from office to shop or from shop to office. If you learn how to run the department, human-wise, you will soon learn how to run it engineering-wise. In many shops today the union steward is running the department human-wise while the foreman is running it engineering-wise. This is because the union steward is constantly looking for ways to serve the employees. The foreman is all too often too busy to answer questions or get the information the employee wants. Use the friendly approach at all times. Get tough only as a last resort.

A E Salmons
Philadelphia, Pa

IF THE SHOP Ed has in mind is engaged on an engineering product, then, surely, a qualified engineer would be an automatic choice for shop foreman. This should not be taken to mean that good operators, trained in the shops but without an apprenticeship training or technical qualifications, would not make successful foremen or should not be given the chance of promotion. To be a good operator is, of course, no guarantee that that self-same operator would make a good foreman. Industry is becoming more and more complex each year. High-speed production, almost unbelievable accuracy, endless variety of metal alloys are only a few of the modern industrial headaches which demand that the potential or embryo foreman should have a specially trained mind.

That is what engineering schools and colleges set out to do—to give aspiring youth a thorough grounding in engineering principles. To teach them the reasons why certain things are automatically done in the shops and which are just as automatically accepted without question or inquiry by most operators. That training teaches students to think for themselves, to inquire, to aspire. In short, if the student has made full use of his time at training school, college or university, he comes out with a trained, logical mind and can apply himself with greater confidence and greater success to shop problems than can the good, purely shop-trained operator who was less fortunate in the matter of technical training.

In the general production and maintenance shops the foreman must have a much greater range of engineering knowledge, a wider horizon, than his opposite number engaged on repetition or mass production work. The shop foreman who is a trained engineer, who can calculate the angles if required, handle all the drawings, fractions, decimals or millimeters, and who is familiar with the American method of projection in addition to the English method, has a big pull over the promoted

"You know the temporary badge you gave me when I lost the temporary badge I had after I lost my badge? I can't find it."

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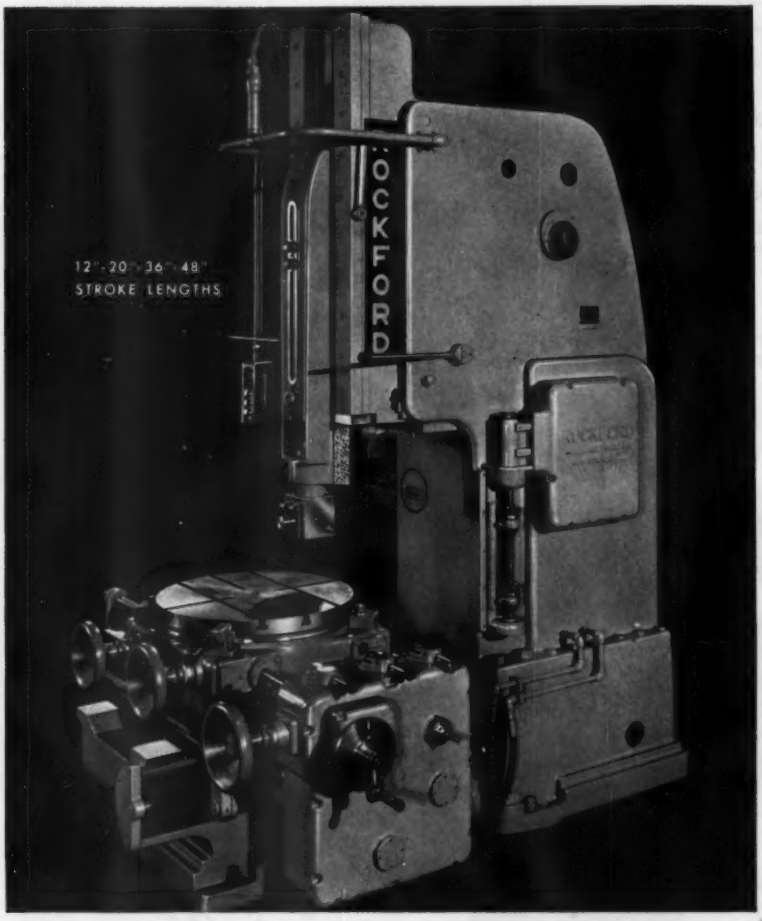

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Hydraulic Slotters have power feeds and rapid traverse in all directions, and they may be equipped with Kopy-Kat Duplicators for fast, accurate duplicate-machining. When you modernize your production facilities plan on Hydraulic Shapers, Planers and Slotters to provide the fastest, most economical production methods.

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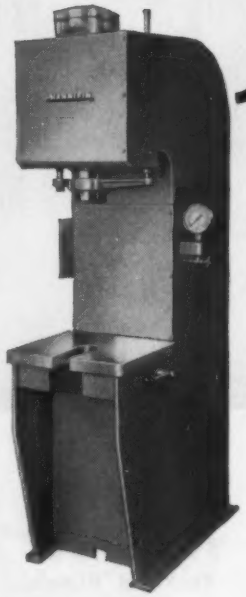

1-TON	$ 552
2-TON	$ 627
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operator with little or no technical knowledge and no actual, systemized technical training.

Can they overcome the lack of shop experience by applying school learning? Not altogether; they must learn the shop side too, before they can be regarded as complete foremen. British manufacturers learned that lesson some years ago when it became the fashion, almost a craze over here, to engage young, trained engineers fresh from college and pitchfork them into the shops as foremen. Some employers, themselves not trained engineers, seemed to feel that possessing an engineering degree was the equivalent of a magic wand which a youth could wave over the shops to insure trouble-free high production. In due course, it became clear that, so far as shop work was concerned, a degree, of itself, was a minor qualification and that the young, qualified engineer was really a beginner in the shops.

Since those days I have put many of the student type through my hands. The following is the usual procedure. The student spends his first summer vacation, usually two months, in the shops on the milling section where he is employed on plain milling. The following year he spends two months on shaping and slotting. Third year, two months planing and grinding, fourth year, two months lathe work and the fifth year, two months fitting shops. That is ten months' shop experience, not a very extensive or intensive training, but a brief introduction which has taught him something about handling machines and tools on actual production, under actual shop conditions.

If he gets his degree at the end of his five-year course, he will probably be engaged as a leading hand, for a try out. Some are not suitable for production and never make the grade; mostly, they are the academic

"Th' fact that you're sittin' on my torch lighter I don't mind . . . IT'S JUST THAT I'M STILL HOLDING IT!"

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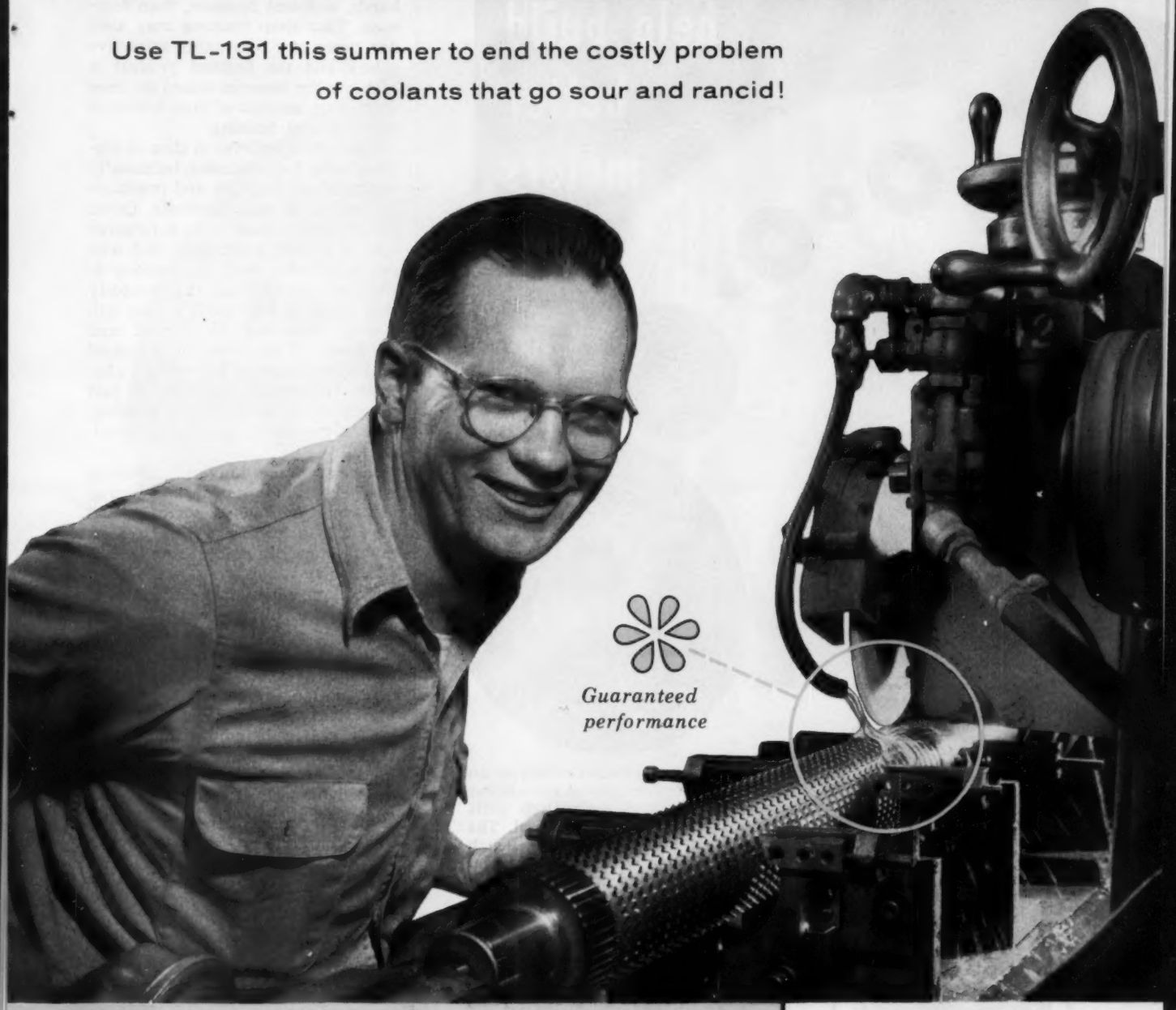
Use TL-131 this summer to end the costly problem of coolants that go sour and rancid!



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Johnson's TL-131 Cutting Fluid is guaranteed to eliminate and prevent unpleasant coolant odors for a period of 2 months in machine tools of all types, when used according to instructions.

The full purchase price will be refunded if any unpleasant odors occur by using Johnson's TL-131. This Guarantee applies where a machine or central coolant system is entirely recharged with TL-131.

There is no limit on the quantity of TL-131 covered by this Guarantee either in single machine tools or in central coolant systems.

In addition, TL-131 consistently outperforms ordinary coolants to provide increased tool life and greater production. Remember, TL-131 is the coolant that reduces work heat by 400° F. See your local distributor for an in-the-shop test.

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Federal uses a Reeves drive arrangement operating through a gear box to permit flexibility of adjustment of indexing rate. The die slide is spring loaded to insure identical weld force at each station. The manufacturer finds this welder gives a more uniform motor end head, in greater quantities, at reduced costs.

This is another example of how Federal's resistance welding "know how" is paying dividends to one of America's leading industrial concerns. Why not, when next you're considering welding, call *Federal — First in Resistance Welding.*

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WARREN, OHIO

type who usually gravitate towards research and become back-room boys, while others may go into design, etc. Those who make good on production, become shop charge hands, assistant foremen, then foremen. That shop training may take five years at a reasonably attractive salary and the finished product is high quality foremen whom the men respect on account of their technical and practical training.

I am a firm believer in shop executives being well educated, technically equipped for their job and practically trained in shop methods. Other things being equal, a shop foreman who is a good maths man and who can handle the tools has nothing to fear and neither has the company that employs him. Such a man will always command the respect and obedience of his men and his chief will have reason to respect him also. Shop knowledge, however, is just as important as technical training. Such a foreman is a potential president.

In *my* youth, a university training was beyond the reach of most youngsters but some of us got over that hurdle by attending evening classes; mine is a case in point. I rose at 4:30 AM, walked four miles to the plant for a six o'clock start. In winter, I did three nights per week at night school, after which I walked four miles home, arriving about 10:00 PM and up again the next morning at 4:30. No longer young, I have never regretted that drill, just as I have never ceased to admire and value those who have had a 'varsity training. To established foremen handicapped for lack of technical knowledge, I would say "Go to it, it's later than you think."

C Mackinnon
Glasgow, Scotland

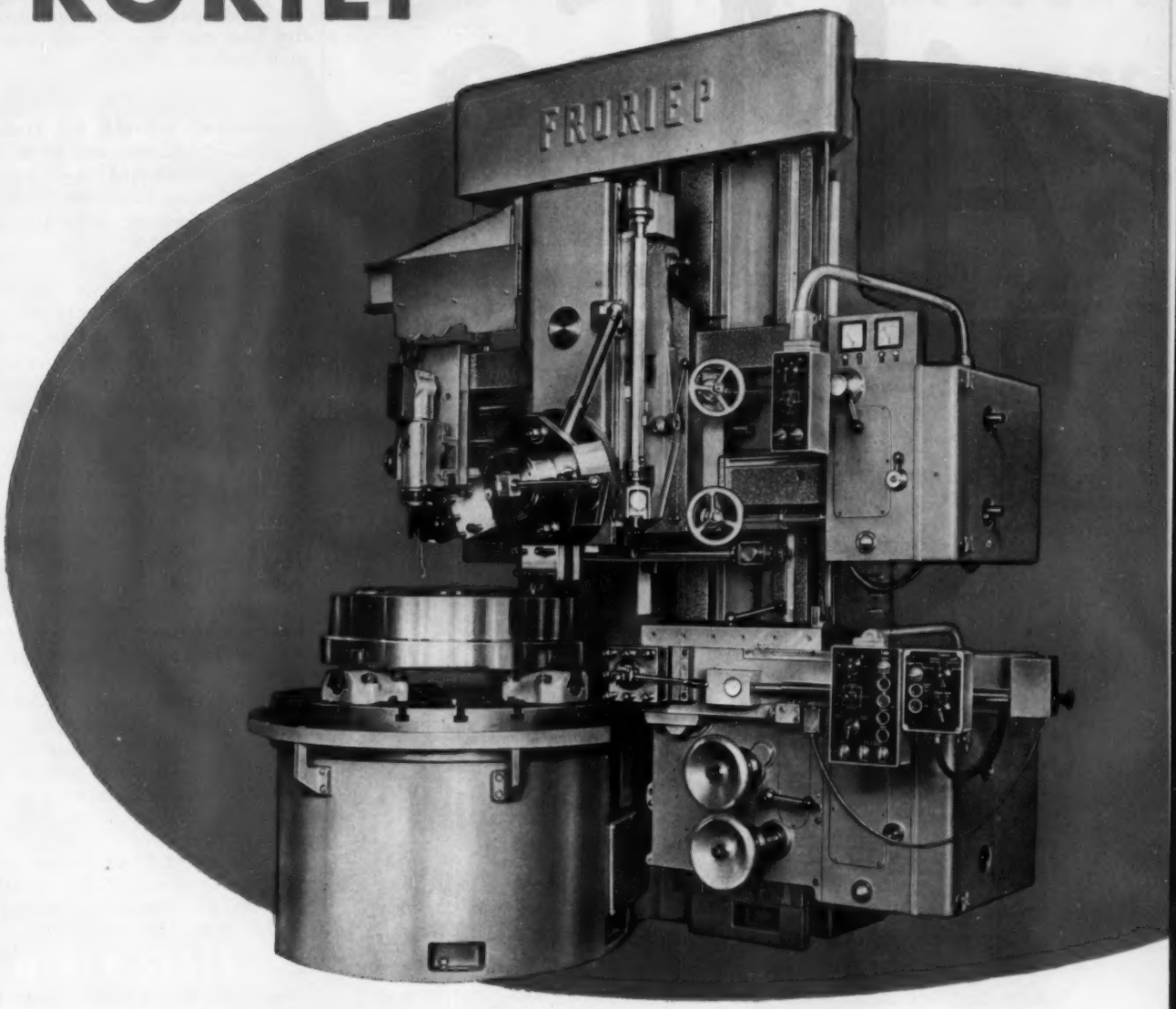
New Books

BETTER TOOL CRIBS—*By William Raisglid. First edition. Published by The Industrial Press, 93 Worth St, New York 13, NY. 152 pages. Price $4.00.*

Shop-level details on how to set up a tool crib (including how wide an opening in the cage for issuing tools should be) are the subject of this text. It includes instructions on where to locate a crib, how to store tools, how to display them, brass tool-check systems, charge-slip controls, records, and other helpful hints.

The book is clear, well illustrated

FRORIEP



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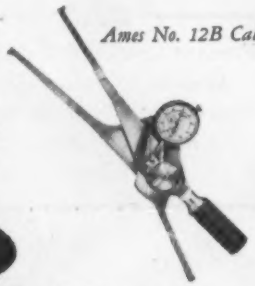
If you would like to have our recommendations on your measurement problem, send blueprints and specifications. And ask for your free copy of our catalog on Ames micrometer dial indicators and gauges.

Ames No. 2 Dial Comparator



Ames No. 12B Caliper Gauge

Ames No. 552 Dial Micrometer

Representatives in principal cities. B. C. AMES CO. *26 Ames Street Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

with photos and drawings, and sensibly organized. It should be ideal for instructing shop personnel in the how and why of tool cribs and tool control.

•

PROTECTIVE COATINGS FOR METALS—*By R M Burns and W W Bradley. Published by Reinhold Publishing Corp, 430 Park Ave, New York 22, NY. 643 pages. Price $12.00.*

This second edition is No. 129 in the American Chemical Society's series of monographs, and as such, it can be considered the last word on the subject of metal corrosion and protection against corrosion with coatings.

Although the book could be used as a text on the subject, it is more likely to be put on a bookshelf as a reference, for which purpose it is excellent. It covers the whole field of protective coatings—metal plates, chemicals, paints, oils, and whatnot. Furthermore, it explains the best methods of applying these coatings and gives best industrial practice in most cases.

Among metal coatings, it describes and explains hot dipping, metal spraying, cladding, plating, and others. In addition to giving up-to-date information, the book presents historical data to show how each process developed.

There are a large number of tabels giving standard data, a limited number of illustrations, and a detailed index by subject.

•

PRACTICAL PLANT LAYOUT—*By Richard Muther—Published by McGraw-Hill Book Company, Inc, 330 West 42 Street, New York 36, NY. 2007 pages, 1406 illustrations, 544 tables. 8½ x 11 in., hard cloth cover bound. Price $12.00.*

The author wastes no time in telling production people what is to be known about present-day practical plant layout. The book was written primarily for two groups of engineers—men currently charged with the responsibility of making plant layouts, and secondly for engineers with industrial experience in areas other than layout, but who must now learn about layout-planning work. The information is compact and direct and spares no effort in telling "what-to-do" and "how to do it." Throughout the entire book there are detailed examples, case illustrations, specific techniques to

HIGH PRESSURE
HYDRAULIC CYLINDERS

Provide Desired Thrusts Up To 160 Tons Plus!

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

Immediate Delivery on Large Selection

Most complete quality line ever offered for 2000-3000 psi heavy duty service. Bores up through 12", strokes up to 22 feet, 19 standard mounting styles. Millions of maintenance-free strokes per cylinder *proven.* Available in single and double rod end, cushioned and non-cushioned, over-size rod, and "high temperature" service cylinders.

Over 2,000 selections — covering 17 popular mounting styles in 1½" through 5" bores and 1" through 36" strokes—now available for **immediate shipment.** Miller Air Cylinders also in stock for immediate shipment.

Write For Catalog and Stock List

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly

WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

MILLER FLUID POWER CO.
(Formerly MILLER MOTOR COMPANY*)*

2004 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

ANOTHER EXAMPLE of

● When General Water Heater Corp., in Burbank, Calif., switched from hand spray to Ransburg No. 2 Process in painting water heater jackets, paint mileage increased almost 65%. Where General formerly got 370 square feet per gallon of paint, they now get over 610 per gallon.

On this installation, units ranging from 20 to 100-gallon size are painted with Ransburg No. 2 Process reciprocating disc atomizer. Changes in jacket sizes can be made without stopping the conveyor. With the reciprocating disc atomizer, change in stroke length is made "on the fly" without shutting down production. General also paints smaller parts, such as heater tops, bottoms, doors and legs, with the Ransburg equipment.

In addition to paint and labor savings, General Water Heater is getting "excellent consistency" and a high quality finish on their products. Another on-the-job-example of the unmatched efficiencies of the Ransburg No. 2 Process of electrostatic spray painting!

Ransburg maintains complete laboratory facilities for test-painting YOUR products under simulated production conditions. Why not let us show you what Ransburg Electrostatic Processes can do for you in YOUR finishing department. No obligation.

For further information about Electrostatic Painting Processes and complete Ransburg services, write Dept. AM.

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana
RANSBURG

aid the practical engineer who needs the answer. Data for the book was compiled over the past several years from both domestic and foreign engineers, consulting firms, and a variety of industries both here and abroad.

New Films

A NEW APPROACH TO COPY TURNING —*Produced by The New Britain Machine Co, New Britain, Conn. 16 mm, color, sound. Running time 28 min. No charge.*

Film describes New Britain GF copy-turning machine for contouring shafts, faces, or bores. Machine line was developed in Switzerland, redesigned by New Britain. Movie shows operation, including animated drawings to show slide and carriage.

•

BEFORE HYDRAULIC FIRES START — *Produced by Monsanto Chemical Co, 1700 S Second St, St Louis 4, Mo. 16 mm, black-and-white, sound. Running time 12 min. No charge.*

This safety film stresses importance of fire-resistant hydraulic fluids, and features Monsanto's Pydraul F-9. The movie shows advantages for fire resistance, exhibits F-9's viscosity, lubricity, and stability, and shows how to recover and change over to it.

COATED ABRASIVE BELTS SPEED METALWORKING PRODUCTION — *Produced by Behr-Manning Div, Norton Co, Troy, NY. 16 mm, color, sound. Running time 27 min. No charge.*

This covers latest developments in coated-abrasive technology, including offhand, lathe, semi-automatic, and automatic work with appropriate equipment. Materials and shapes handled are varied. Pre-polishing techniques are shown.

•

EXTENDING THE RANGE OF MODERN SURFACE GRINDING. *Produced by DoAll Co, Film Div, Des Plaines, Ill. 16 mm, sound, color.*

Here's a movie that production men will find really worth while, for it shows how to get more production and perform more jobs on a surface grinder. It points out that new grinder features and attachments permit application of the surface

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Performs 23 operations every 18 seconds on automotive intake manifold!

This Buhr 5-way dial-type hydraulic-feed Special mills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross.

The Machine is equipped with a Buhr 60"-diameter 6-position automatic index table, complete with shot bolt.

Chips are disposed automatically by means of a rotating chip conveyor.

Parts are loaded one per station in each of the six single-place fixtures. Power wrench with torque-control, automatically operates clamping mechanism.

Buhr's precision manufacturing methods provide complete interchangeability of all parts and component assemblies.

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously—without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

grinder to hundreds of jobs other than ordinary flat grinding. Sequences show use of the high-speed spindle for grinding hard-to-reach surfaces and recesses with small wheels, grinding tapers, squares, angular, and multi-surface forms. Another scene covers the dressing of the wheel for flat or shaped surfaces, and the final scene shows the use of hopper-fed automatics.

•

WILLIAM JOHNSON AND THE DRAGGIN'. *Produced by Cincinnati Milling Machine Co, Cincinnati 9, Ohio. 16 mm, sound, color. Running time 13 min. No charge.*

Suitable for all levels of audiences, from foremen to top management, as well as bankers and others interested in finance, this clever and interesting film points out the importance of machine replacement. Although prepared in humorous vein, it is highly successful in getting over the point.

In brief, King Customer is dissatisfied because of lack of progress and decides something is draggin'. His advisers suggest various unsound remedies, but William Johnson locates the real trouble with his "draggin' locator." He exposes "dragging' from wearing out," and "dragging' from obsolescence." The film contains no advertising.

•

ELOX ELECTRICAL DISCHARGE MACHINING. *Produced by Video Films for Elox Corp, 740 N Rochester Road, Clawson, Mich. 16 mm, sound, color. Running time 20 min.*

What electrical discharge machining is, how it works, and what it can do, are shown clearly in this unusual film. Combining animation to explain the theory, and actual "underwater" photography to show the action, the picture is readily understood by technical men and layment alike.

An extremely interesting sequence, showing the cutting of a ½-in. hole through a half-inch of tungsten carbide was produced by time-elapsed photography. A portion of the cut was made, then the coolant was drained from the tank, the two-section workpiece split, and an exposure made. Then the tank was filled and the process repeated. It took eight hours to film the normal 15-min operation that is shown in 45 sec on the screen. Other operations shown include bottoming cuts and grinding. Close-up pro-

AS A STANDARD SURFACE GRINDER

The basic DELTA Toolmaker Surface Grinder is a big, rugged machine with the massiveness and solidity required for surface finishing in tool room or production line.

AS A CHIP-BREAKER GRINDER

Add the Univise and Coolant attachment, and your Toolmaker Surface Grinder is a precision machine for grinding all angles of the chip-breaker groove in carbide tipped tools.

AS A TOOL AND CUTTER GRINDER

Holding your work either in the Unihead or between centers, your Toolmaker Surface Grinder is equipped to economically grind and sharpen tools and cutters to original specifications.

3 PRECISION GRINDING OPERATIONS

ON 1 RUGGED, ROCKWELL-built DELTA Toolmaker® GRINDER

In your plant, 90% of the precision grinding operations can be economically handled by DELTA Toolmaker Surface Grinders equipped with three inexpensive attachments. With these accessories: a coolant attachment, a Univise®, and a Unihead®, you can maintain consistently high grinding and sharpening output of milling cutters, reamers, taps, saw blades, etc. — both high speed steel and carbide-tipped cutters. All this is in addition to the extremely accurate surface finishing obtainable with the DELTA Surface Grinder itself.

Placed in appropriate positions throughout your plant, DELTA Toolmaker Grinders effectively eliminate the "Toolroom Bottleneck." Their low initial cost, dependable accuracy, and rugged construction make them ideal where the demands of fast production and absolute accuracy are inseparable.

Learn how these and other Rockwell-built DELTA tools can save money in your plant. Get in touch with your DELTA Dealer; he's listed in your classified directory under "Tools" or "Machinery."

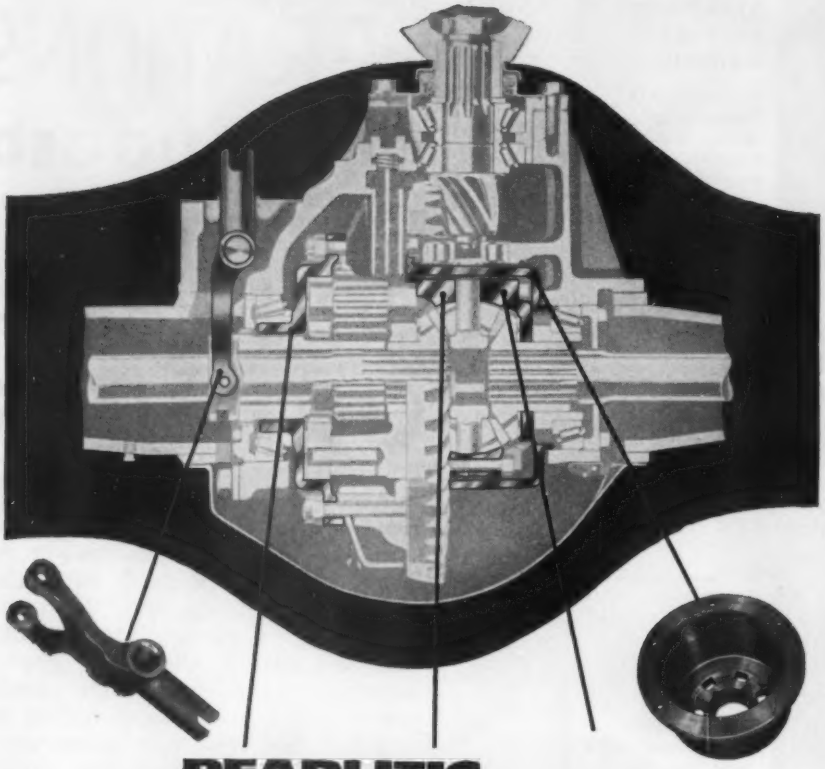
Delta Power Tool Division, Rockwell Manufacturing Company, 618F North Lexington Avenue, Pittsburgh 8, Pa.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

DELTA QUALITY MAKES THE DIFFERENCE

for **HEAVY DUTY** service



PEARLITIC MALLEABLE CASTINGS

The 2-speed truck axle is a *must* under varying load and road conditions because it provides a tailor-made ratio for every condition. But it takes a severe beating under heavy duty conditions encountered in logging, mining, farming, etc.

That's why Eaton Manufacturing Company, leading producer of 2-speed axles, specifies pearlitic malleable — from National — for several vital parts. For Eaton knows that pearlitic malleable has high ultimate strength . . . resists wear under heavy loads at high speeds . . . possesses excellent non-seizing properties. In addition, pearlitic malleable can be given a smooth finish . . . can be either liquid or air quenched. And perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90* (B1112 steel = 100).

Look your product over critically. Pearlitic malleable castings—from National—can replace costlier fabrication methods . . . can offer opportunities of reduction in weight, machining and assembly time. AA-1197

Photos: Courtesy Eaton Manufacturing Company

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

jected on a 6-ft screen give magnification to 150X and permit examination of the fine finish obtained.

Although widely used in industry the process is still pretty much of a mystery to most people. The 20 min spent in viewing this film will dispel the mystery and do more good than a textbook.

Names in the News . . .

Major General (Ret) Victor E Bertrandias, formerly vice president of Douglas Aircraft, in charge of export, has been named vice president of Hammond Manufacturing Corp, Pasadena, Calif.

Vincent P Rumely, senior vice president and board member of Crane Co, Chicago, has retired.

Frank W Fink, formerly chief engineer of the San Diego Division of Convair, has joined Ryan Aeronautical Co, San Diego, as vice president and chief engineer.

George R Weppler, formerly vice president of operations at Waterman Pen Co, Seymour, Conn, has been appointed vice president and assistant general manager of Harvey Hubbell, Inc, Bridgeport, Conn, manufacturer of electrical wiring devices and rolled thread machine screws.

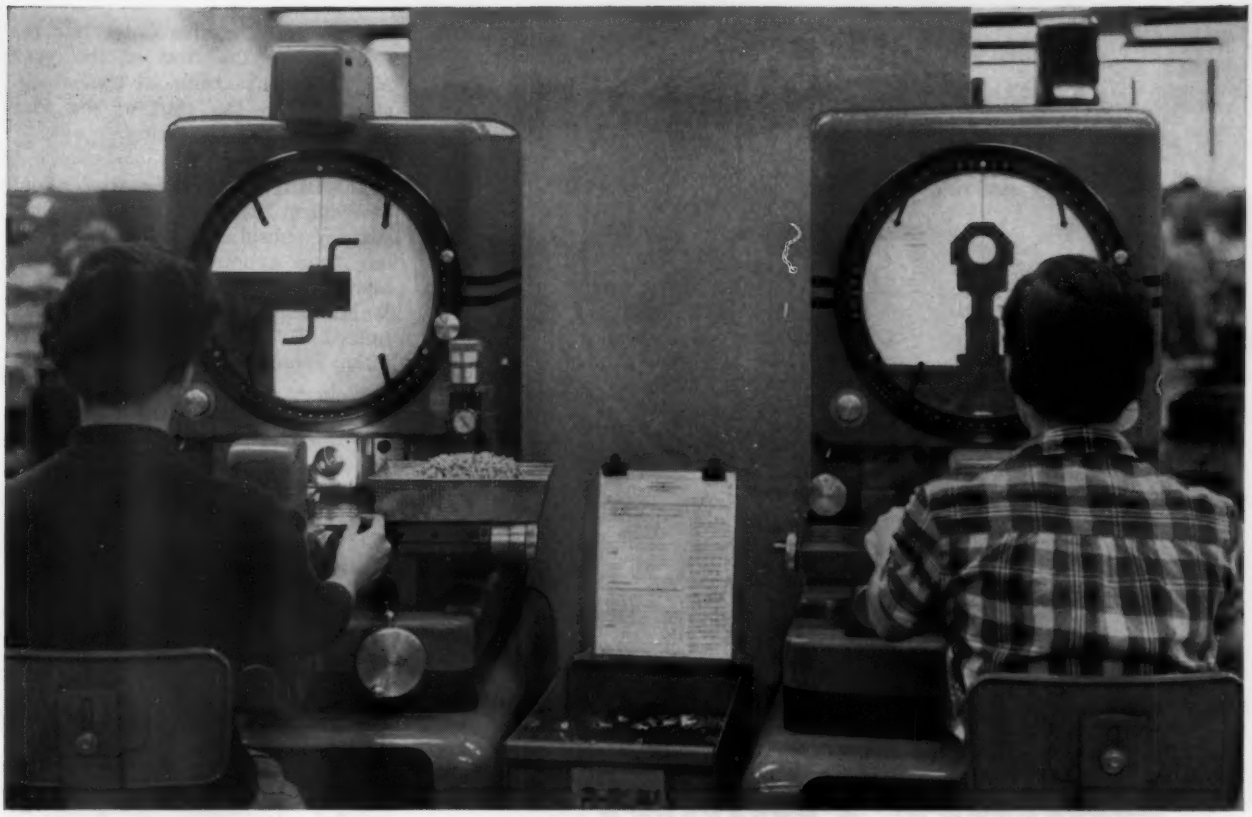
Claude L Boring, formerly division manager of the Plomb Tool Co, has joined the Erie Foundry Co, Erie, Pa, as assistant to the president.

William T Suggs, formerly consulting engineer of Stuart Engineering Co, Newark, NJ, has been named manager of the newly established Can Division of White Metal Manufacturing Co, Hoboken, NJ.

O'Keefe & Merritt Co, Los Angeles, promotes: **Robert J Merritt,** head of production, to vice president, manufacturing; **Gordon D Boyle,** sales manager, to vice president, sales; and **Lewis G Mitchell,** secretary, to vice president and secretary.

Adolph Vlcek, Jr, manager of quality control at Glenn L Martin Co, Baltimore, Md, has been appointed tooling manager, succeeding **Glenn A Evans,** who has left the company.

Oliver H Jacobs, production supervisor for the past 25 years at Dodge



Girls at the Allen-Bradley Company, leading makers of electrical equipment, use Kodak Contour Projectors to inspect incoming precision parts quickly and accurately.

To speed parts from receiving dock to production . . . Allen-Bradley uses Kodak Contour Projectors

Receiving inspection can be a bottleneck, slowing the production operation when, on an average day, many separate shipments of component parts crowd the receiving room.

To avoid such a bottleneck and keep production lines moving, the Allen-Bradley Company combines statistical sampling methods with modern gaging equipment. Kodak Contour Projectors are used to check more than 400 different items, most having multiple dimensions and sample sizes of 35 or more pieces. Tolerances are held as close as .001".

Because optical gaging affords a check of several dimensions simultaneously, Allen-Bradley has cut inspection time dramatically: a typical part, requiring minutes to gage mechanically, now is checked in 12 seconds optically.

The result: No unnecessary delays—parts are quickly cleared for production. And quality control has improved.

You'll find that Kodak Contour Projectors are profitable wherever you need fast, accurate, complete inspection or measurement of almost any sort of part—simple or complex, large or small. And there are models to fit every need from the large Model 30 to the bench Model 8. To learn more about optical gaging and how it can help solve your problems, send for our illustrated booklet, "Kodak Contour Projectors." Use the coupon below.

the KODAK CONTOUR PROJECTOR

EASTMAN KODAK COMPANY 90
Special Products Sales Division, Rochester 4, N.Y.

☐ Please send me a copy of your booklet, "Kodak Contour Projectors."
☐ Put me in touch with your representative.

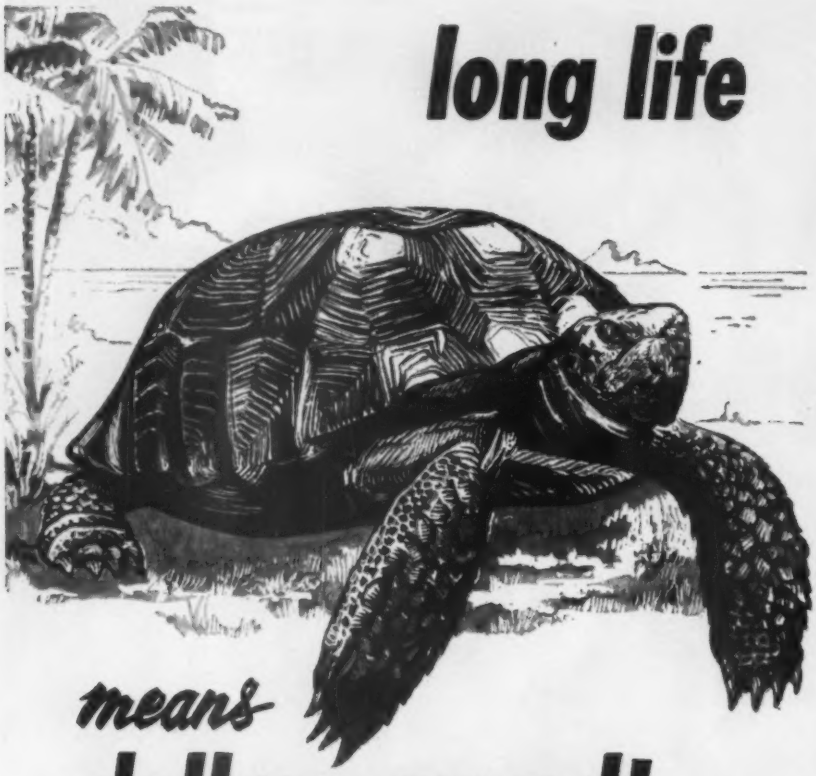
NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____
(Zone)

Kodak
TRADE-MARK



long life

means

dollars saved!

Whether a 200 year old tortoise would admit this statement is debatable, but with Diamond Wheels it is an indisputable *fact.*

Even then, long wear depends upon many factors; Speed, correct use of coolant and of prime importance, the wheel must be just right for your job . . . in diamond grit size, bond, and in every other detail.

We at **J. K. Smit,** know after many years experience how to satisfy every grinding and cutting need.

Send for your copy of our new Diamond Wheel Catalog No. 54.

SUPER MATERIAM IGNIS TRIUMPHARE

J. K. SMIT & SONS, INC.

HOME OFFICE AND PLANT

MURRAY HILL NEW JERSEY

Additional plants in London, Paris, Amsterdam and Toronto, Canada

Division of Chrysler Corp, has retired. Since the first of the year Mr Jacobs has been on special assignment on the staff of the vice president, manufacturing.

Frank Lang, Jr, plant superintendent of Wausau Manufacturing Co, Borg-Warner subsidiary at Wausau, Wis, has been appointed resident plant manager of the Brooks Equipment & Manufacturing Co, recently acquired B-W subsidiary at Knoxville, Tenn.

R F Parker, sales engineer, has been appointed manager of carbide component sales for Carboloy Department of General Electric Co, Detroit.

William E Liesman, associated with the Parish Pressed Steel Division of Dana Corp in engineering and sales capacities, has been named assistant sales manager of the division.

Lewis N Beaver, formerly plant manager of the Norton Division of Yale & Towne Manufacturing Co, Berrien Springs, Mich, has been appointed plant manager of Dor-O-Matic Division, Republic Industries, Inc, Chicago.

Edwin W Lehtonen has been named chief tool engineer of Friden Calculating Machine Co, San Leandro, Calif. He succeeds **William B Nonamaker,** retired.

John J Mlynski, district sales manager, Clark Equipment Co, Battle Creek, Mich, has been appointed central region sales manager for the Industrial Truck Division. He will make his headquarters in Chicago.

John L Dempsey, chief development engineer for Servomechanisms' Eastern Division, has been appointed division manager of the company's Components Division, Westbury, NY.

Ford Motor Co's Lincoln Division appointments: **W D Singleton,** assistant general manufacturing manager of Ford Division, to general manufacturing manager of Lincoln; **H B Daniels,** assistant general sales manager, Lincoln Division Services, to general sales manager of Lincoln; **D R Learned,** assistant controller of Ford, to controller, Lincoln; **L E Krieg,** manager, Organization and Systems Department, Ford, named assistant to the general manager, Lincoln, and operations manager, Continental Division; **Will Scott,** manager of the Product and Volume

AIRengineering at work
REPORT No. 4150.25

Cuts 60 Second Metal Drilling Job to 15 Seconds . . . with Air Punching Tool

A sub-contractor for a large auto manufacturer formerly used two men, an electric drill and a drilling jig to drill two 1/4" holes in rear auto fenders.

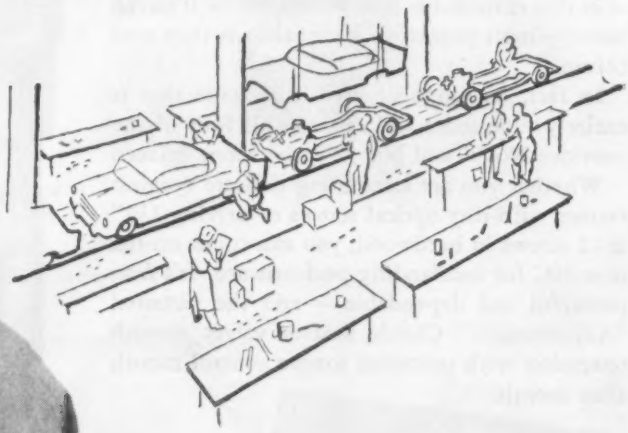
This method required a whole minute and failed to provide uniform results. In addition, paint damage and broken drills caused excess time loss.

AIRengineering by Ingersoll-Rand solved the problem fast. A size AR130 Air Buck Riveter was equipped with special yoke, punches and stripping mechanisms. The holes are now punched four times faster, with closer tolerances and only *one* man is required instead of two.

If you are in a position to encourage cost-savings in your plant, you should see I-R's confidential manual reports on "AIRengineering at Work". Write on your company letterhead and we'll arrange for you to see it soon.

AIRengineering Manual
Over 100 interesting and helpful case history applications of AIRengineering at work.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.



Air Buck Riveter
Punching two 1/4" holes in rear auto fender.

8-257

NEW MILLERS FALLS No. 50C ELECTRIC SCREW DRIVER

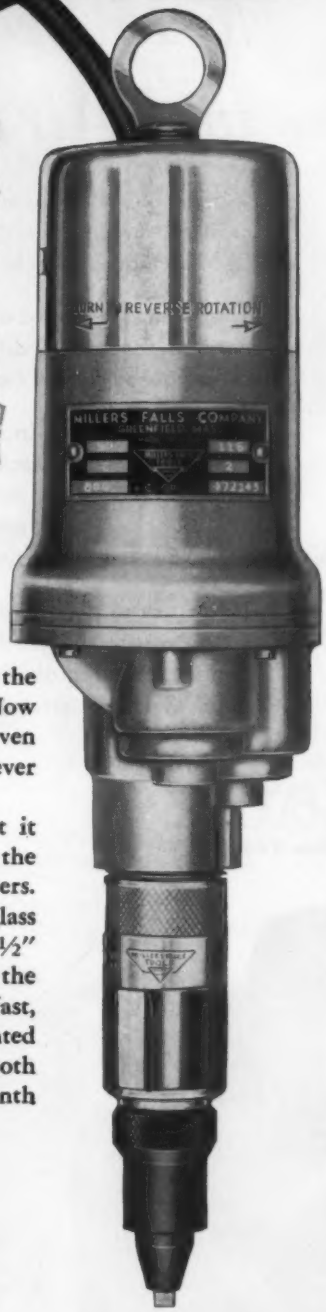
- TWICE THE DRIVING POWER
- GREATER CAPACITY — wood screws up to #12 x 1½" — machine screws to ¼"
- MUCH LONGER BRUSH LIFE
- BUILT-IN REVERSING SWITCH
- INTERCHANGEABLE SWITCH LEVERS (Paddle or Butterfly)

Plus

the famous, super-sensitive ADJUSTOMATIC® CLUTCH

BUTTERFLY SWITCH

PADDLE SWITCH



For years, the Millers Falls No. 50 has been the most successful of all electric screw drivers. Now — in this remarkable new Model 50C — it's even better — more powerful, more versatile than ever before.

In fact, its range of uses is so wide that it entirely supersedes and replaces all four of the previous No. 50 and No. 52 Series screw drivers.

Whether you are assembling delicate eyeglass frames with tiny optical screws or driving 1½" #12 screws in hardwood, you can count on the new 50C for outstanding performance. It's fast, powerful and dependable — and the patented "Adjustomatic" Clutch assures velvet smooth operation with precision torque control month after month.

FREE DEMONSTRATION

Let us show you how the new No. 50C Screw Driver cuts assembly time — gives better, more uniform work at lower cost. Write, too, for literature on the 50C and on Millers Falls wide line of other high-performance electric tools for production and maintenance.

MILLERS FALLS COMPANY
Dept. AM-8, Greenfield, Mass.

MILLERS FALLS TOOLS
SINCE 1868
The Mark of Superiority

Analysis Department, to merchandising and product planning manager; **J H Barnes, Jr,** manager, Marketing Program Analysis Department, Ford, to assistant general sales manager, planning and analysis, Lincoln.

R E Zahn, associated with sales department of Allegheny Ludlum Steel Corp, Pittsburgh, has been appointed manager of tool steel sales for the Dayton district.

Chrysler Corp appointments: **Leo J McPharlin,** supervisor of purchases for the Automotive Body Division, to purchasing agent; **Norman R Reno,** master mechanic of the Marine & Industrial Engine Division, to works manager.

Adolph Burstein, chief development engineer of Convair-San Diego, has been appointed chief development engineer. **S G Frank Haas, Jr,** chief of preliminary design, succeeds Mr Burstein.

Edwin L Slagle, works industrial engineer of the Pittsburg, Calif, plant of US Steel's Columbia-Geneva Division, has been made president of the American Institute of Industrial Engineers. He succeeds **Donald G Malcolm** of Johns Hopkins University.

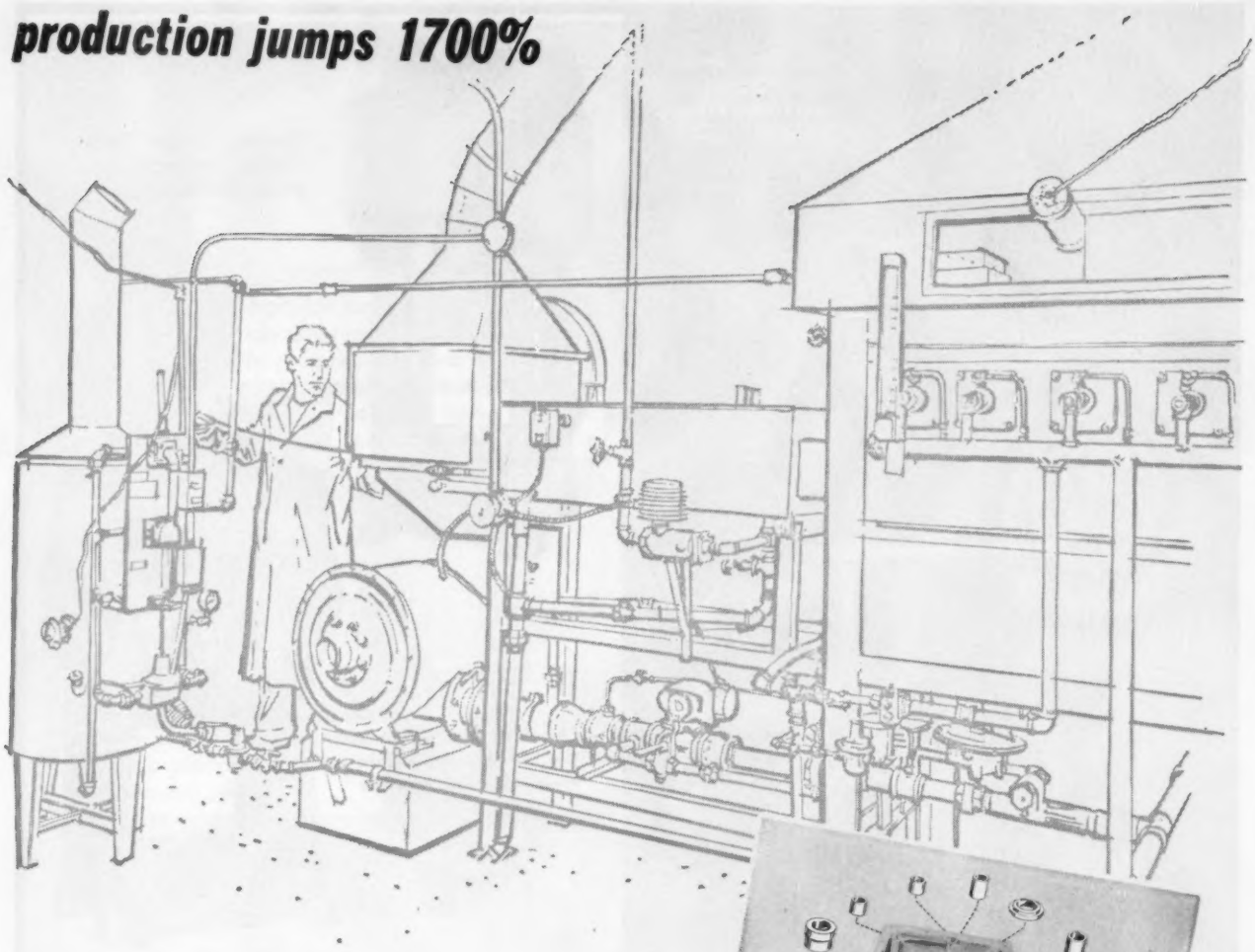
Lawrence J Torn, project engineer for Airborne Instruments Laboratory, Mineola, NY, has been promoted to chief electronics control engineer of the engineering and production division.

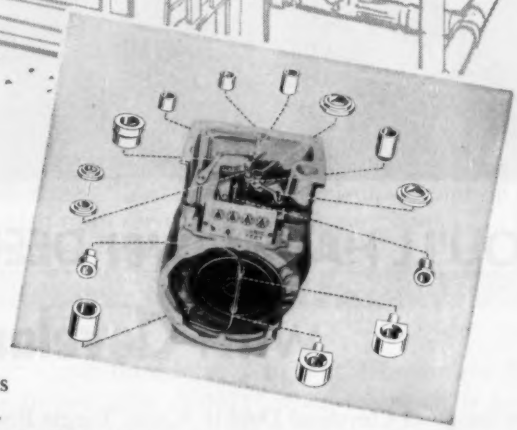
Nicholas Monsarrat, associated with the Universal Winding Co, Providence, RI, for the past two years in contract administration, has been placed in charge of all ordnance development at the company's Cranston, RI, plant.

Austin R Zender, executive vice president of Bridgeport Brass Co, Bridgeport, Conn, has been elected president of the Copper & Brass Research Association.

New assignments at the Long Beach (Calif) Division of Douglas Aircraft Co: **S D Podesta,** head of production control project, to superintendent in charge of installation, final assembly, and modification of all products; **D F Alcorn,** chief of materiel, to manufacturing control manager; **M A Garrett,** production control supervisor, to succeed Mr Podesta; and **H C Backstrom,** material control general supervisor, to succeed Mr Alcorn.

production jumps 1700%





in 'powder room' for metal

When the American Meter Company started sintering precision parts for their meters, their production curve shot up like a scared rocket. For example, they formerly machined one of the bushings, with a production rate of 230 pieces per hour. The same part, of sintered bronze powder, is now turned out at a rate of 4,000 per hour! That's an increase of 1700%!

Meter buyers benefit from the changeover, too. Sintered parts improve meter operation: self-lubricating, they reduce friction loss that upsets accuracy, eliminate the necessity of continual maintenance.

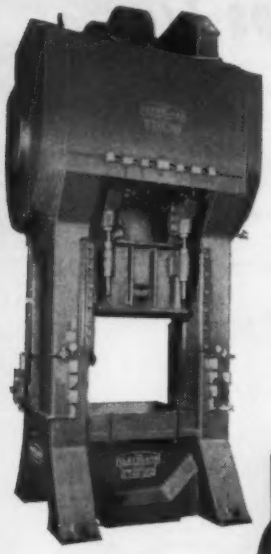
Heart of the sintering process at American Meter is a Surface Combustion gas-fired muffle furnace with cooling chamber. Sintering of the metal powder (90% copper, 10% tin) is done at 1550° F. A 'Surface' automatic MAX generator provides a furnace atmosphere which protects the parts from deterioration. This equipment is also used to anneal steel and brass parts when production time is available. Surface Combustion will be glad to help you examine the possibilities of powder metallurgy. Write for Literature Group H53-9.

Surface
HEAT TREATING EQUIPMENT

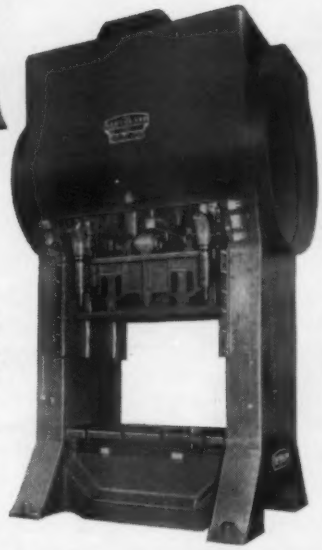
SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF
Kathabar HUMIDITY CONDITIONING Janitrol AUTOMATIC SPACE HEATING

Cleveland Double Crank Double Action Toggle Press—400-ton capacity



Cleveland Single Crank Double Action Toggle Press—200-ton capacity



Cleveland Double Crank Double Action Toggle Press—200-ton capacity

YOU'LL HAVE fewer DEEP DRAW OR STAMPING rejects WITH Cleveland Toggle Presses!

The design of Cleveland Double Action Toggle Presses assures *smoothness of action, perfect timing and absolute dwell of blank-holder slide.* Powerfully constructed and having an ample over-load capacity, they consistently produce difficult deep drawings and stampings accurately. You'll enjoy their trouble-free operation and simplified maintenance. Adjustments are easy.

Cleveland Toggle Presses are designed so that when the blank-holder toggle arms straighten out, the entire blank-holder pressure is transmitted to the frame. This permits total use of crankshaft power for the drawing operation.

Before you buy your next press, won't you let us give you the complete Cleveland story? We make 11 types of Cleveland Presses to assure utmost stamping economy. Just write or call today!

Why Settle for Less than a Cleveland Press

1880 75 1955 YEARS OF CONSTANT PROGRESS *Diamond Anniversary*

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

POWER PRESSES
FABRICATING TOOLS

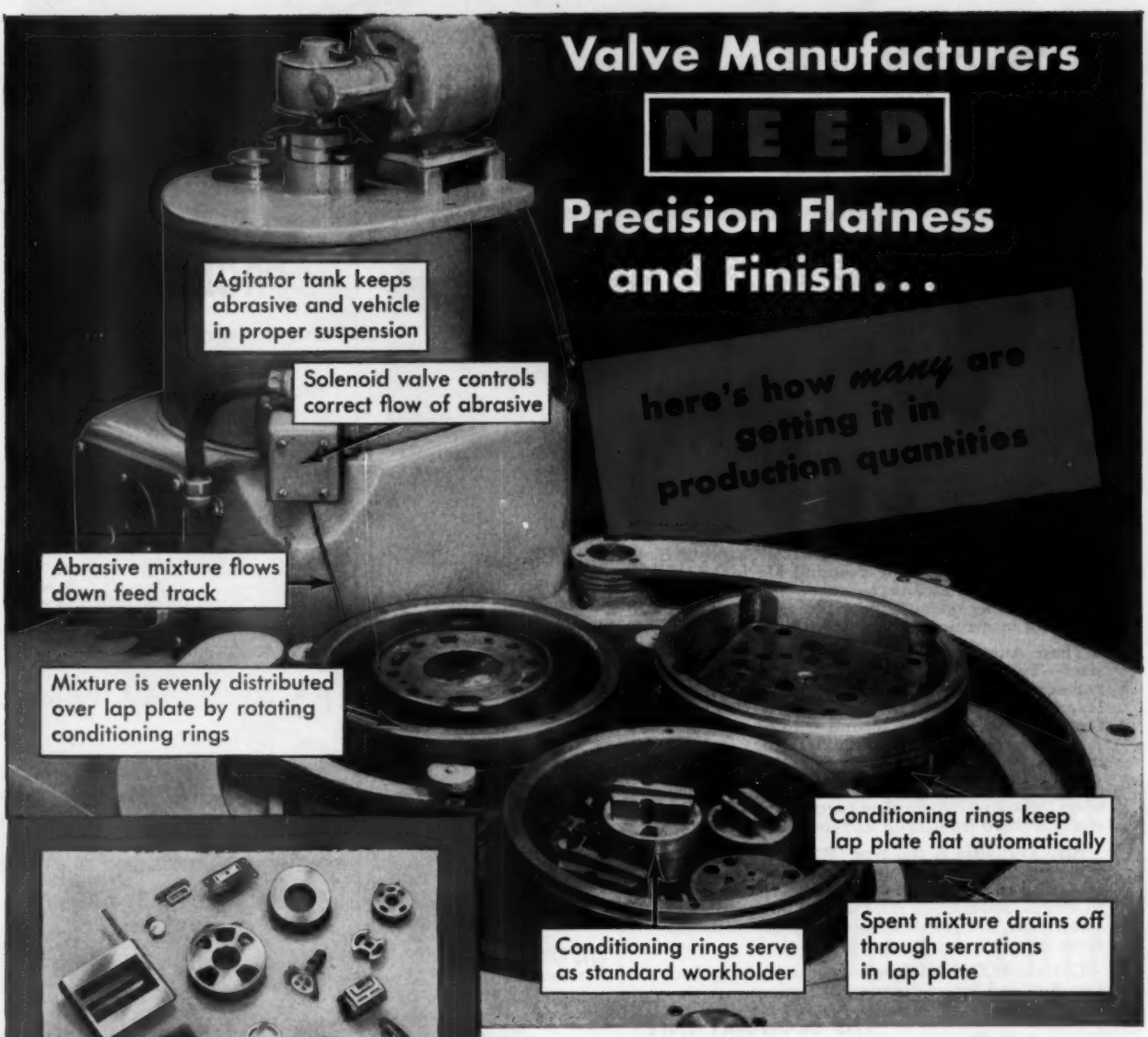
E. 40TH & ST. CLAIR AVENUE · CLEVELAND 14, OHIO

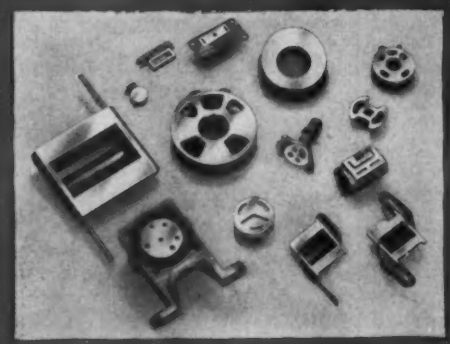
Offices at: NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • E. LANSING • OXFORD, O.

CITY FOUNDRY DIVISION · SMALL TOOL DEPARTMENT

Valve Manufacturers NEED Precision Flatness and Finish . . .

here's how *many* are getting it in production quantities


Agitator tank keeps abrasive and vehicle in proper suspension
Solenoid valve controls correct flow of abrasive
Abrasive mixture flows down feed track
Mixture is evenly distributed over lap plate by rotating conditioning rings
Conditioning rings keep lap plate flat automatically
Conditioning rings serve as standard workholder
Spent mixture drains off through serrations in lap plate



A great many valve manufacturers are included in the more than 500 producers of industrial equipment using Lapmasters. All have found this machine to be the answer to obtaining precision flatness, finish and parallelity in production quantities. Types of valves include gate, slide, hydraulic, solenoid, rotary, diaphragm, etc. The high production accuracy of the Lapmaster (micro-inch finishes of 2 to 3 RMS—surface flatness to less than .000011" when required) is being definitely achieved on all materials including cast iron, steel, stainless steel, magnesium, aluminum, brass, carbon, ceramics, plastics and sintered metals. It will pay you to investigate this modern precision, yet economical, method of machining.

Get all the facts

Here are three booklets that will give you the facts on producing and measuring precision flatness and finish. Write for your copies today.

Crane Packing Co., 1836 Cuyler Ave., Chicago 13, Ill.
In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont., Canada

Lapmaster DIVISION

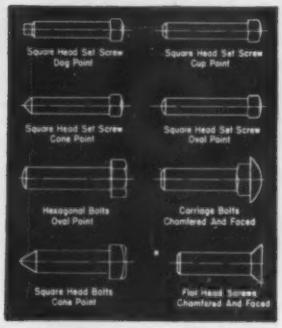
CRANE PACKING COMPANY

38 YEARS INDUSTRIAL PROGRESS

ECONOMY Automatic Pointing Machines

Save Time and Money!

TYPE 3300


Square Head Set Screw Dog Point
Square Head Set Screw Cup Point
Square Head Set Screw Cone Point
Square Head Set Screw Oval Point
Hexagonal Bolts Oval Point
Carriage Bolts Chamfered And Faced
Square Head Bolts Cone Point
Flat Head Screws Chamfered And Faced

Typical parts machined on the TYPE 3300

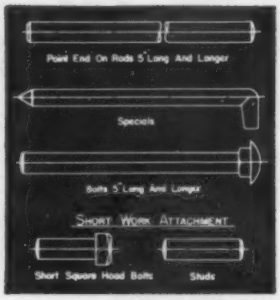
ECONOMY Automatic Pointing Machines are hopper fed and automatic in operation. These features enable operator to run several machines resulting in greater productivity and lower costs.

These Automatic Pointers are available in two sizes—Type 3300 for uniformly pointing bolts and screws to 3/8" diameter and 3/4" to 3-1/2" in length, the type 4600 for pointing bolts and cap screws 1/4" to 3/4" diameter and 1" to 6" in length. A single machine will handle all types of points on many types of bolts and cap screws.

Production rates of the type 3300 vary infinitely from 2,000 to 6,000 finished parts per hour and on the type 4600 from 1800 to 5400 per hour.

Also available is the type "P" Semi-Automatic Pointing Machine for pointing bolts, cap screws, studs and rods 1/4" to 1-1/2" diameter, 5" or more in length. Production rates up to 2,000 pieces per hour make it a valuable secondary machine for short runs.

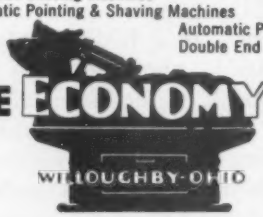
Consult ECONOMY on low cost, high production Bolt and Screw Pointing operations.



Typical operations performed on TYPE "P" Semi-Automatic Pointing Machines

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing & Shaving Machines
Automatic Pointing Machines
Semi-automatic Pointing Machines
Automatic Pointing & Threading Machines
Double End Automatic Pointing Machines



THE ECONOMY ENGINEERING CO.

WILLOUGHBY, OHIO

Designers and Manufacturers of Secondary Operation Machines since 1915

From the *American Machinist* Library of *Tips for Top Shop Men*

IF you resent interruptions when you're busy, set the example by not interrupting others when they're busy. If you are careless with your men's privacy, you can expect them to be careless of yours.

HERE'S YOUR CONSTANT INDEX TO MORE PROFITABLE PRODUCTION

This is just a reminder there's an easy way in which to get information in a hurry for solving those knotty production problems you're faced with daily.

Listed below is a general subject index to the answers you need, as you'll find them in your 1955 PRODUCTION PLANBOOK issue of *American Machinist*.

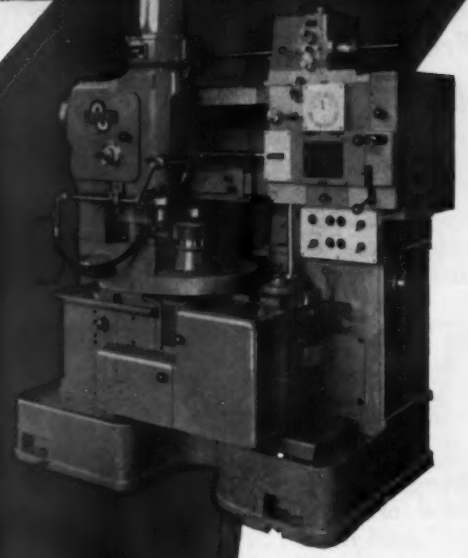
- **A** Management, Personnel
- **B** Machining
- **C** Tooling
- **D** Pressworking, Molding, Casting
- **E** Inspection, Testing, Quality Control
- **F** Assembly, Welding, Portable Tools
- **G** Heat-Treat, Cleaning, Finishing
- **H** Materials, Components
- **I** Materials Handling, Services
- **J** Prize Ideas, Rebuilt Equipment

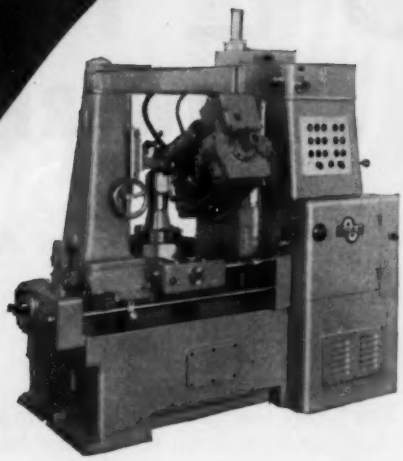
And that's not all. An integral part of these ten sections are hundreds of informative advertisements . . . a list of manufacturers offering free product literature . . . and an alphabetic listing of products and services advertised in the PLANBOOK.

Information like this can help you find sure roads to faster, lower-cost production.

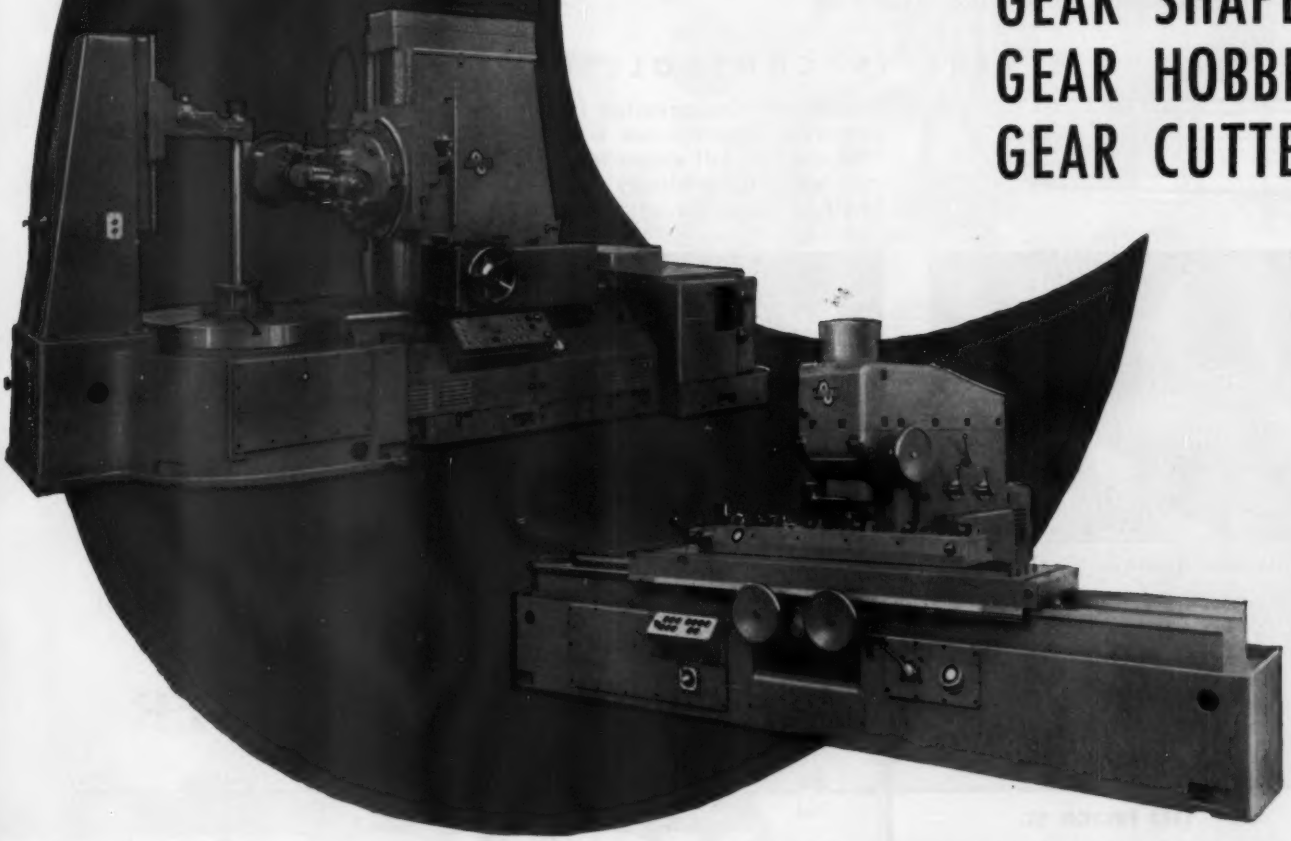
American Machinist
McGraw-Hill Building
New York 36, N. Y.

LORENZ





GEAR SHAPERS
GEAR HOBBERS
GEAR CUTTERS



BINDER

MASCHINENFABRIK LORENZ A.G., ETTLINGEN/BADEN

GERMANY

GENTLE

and POWERFUL too

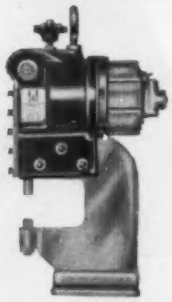
... that is why an Air Press does these jobs so well...

- RIVETING
- PRESSING
- STAMPING
- CRIMPING
- PUNCHING
- MARKING
- DIE CUTTING
- EMBOSSING
- PIERCING
- SWAGING
- DIMPLING
- FORMING
- STAKING

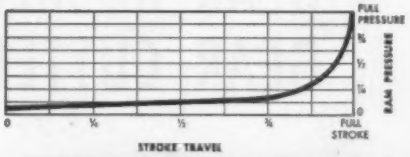
The Keller Compression Riveter is an efficient Air Press with 1⅝" stroke and up to 10 tons compression force. It does scores of jobs better and cheaper than other equipment because it has these advantages:

CONTROLLED POWER
READY ADAPTABILITY
LESS BENCH SPACE
LOWER INITIAL COST
LITTLE MAINTENANCE

It is available in two basic sizes for bench or pedestal mounting. Operates with a 3-way foot valve, or (optional) a throttle handle. So powerful it heads ¼" steel rivets . . . but so gentle it can assemble fragile plastic parts without breakage. Ask for Catalog Section 50.



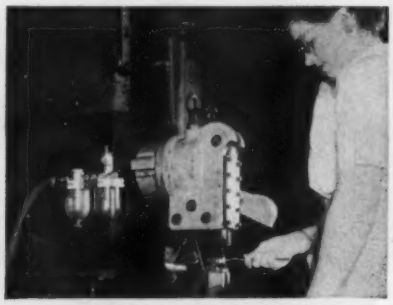
HERE IS CONTROLLED POWER



The Keller Compression Riveter delivers a squeeze—*not* a wallop! The chart at left shows how pressure builds up gradually along the length of the stroke, attaining maximum only at the very end. This gradual build-up of pressure avoids delivering a sharp impact which might distort small parts, or shatter fragile ones.

Assembling fragile plastic parts

Staking pins in electron tubes

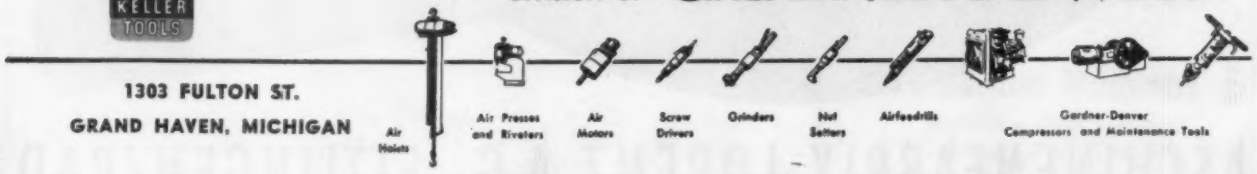


Swaging small metal parts

GARDNER-DENVER Since 1859 K KELLER TOOLS

KELLER TOOL

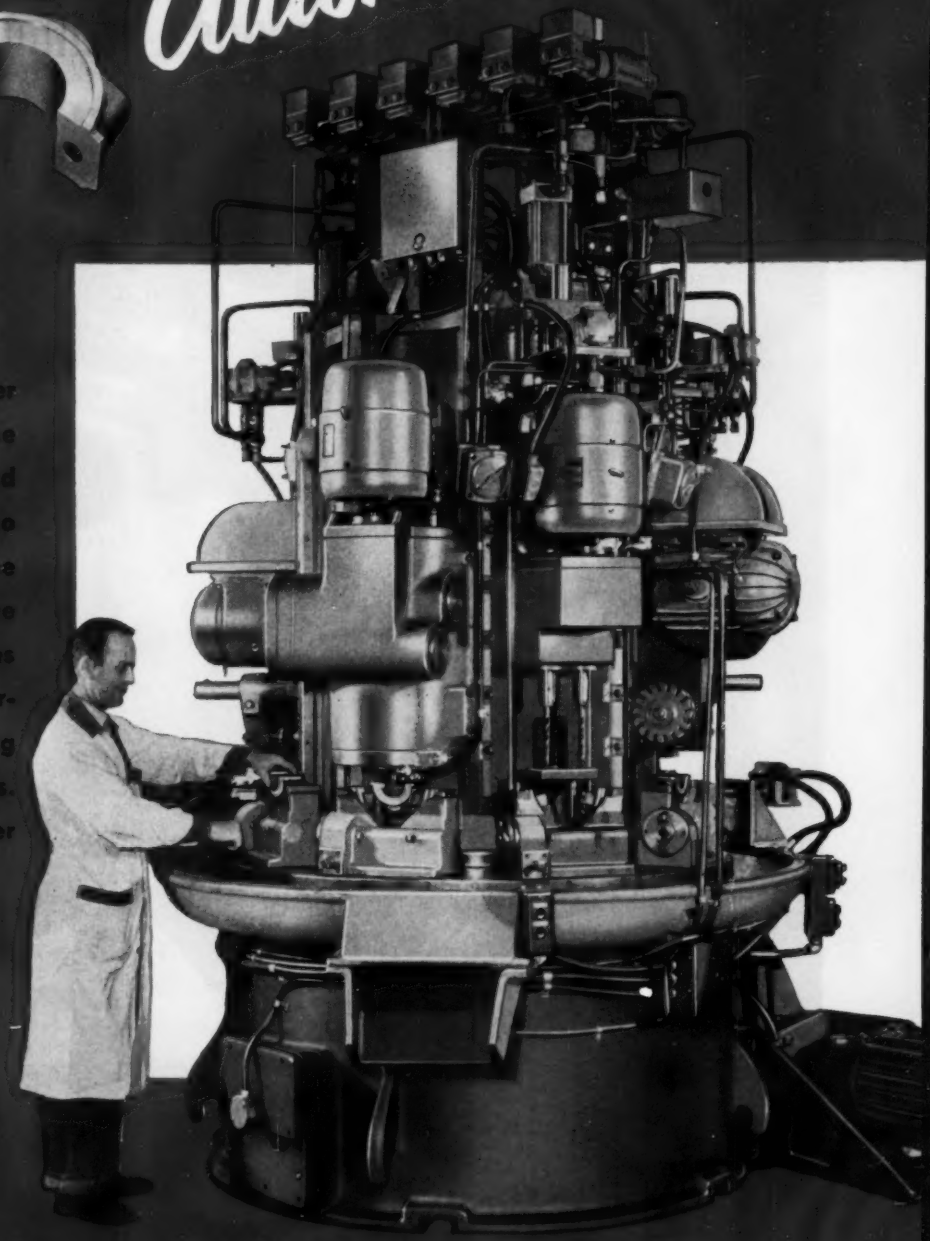
DIVISION OF **GARDNER-DENVER**



1303 FULTON ST.
GRAND HAVEN, MICHIGAN

4 separate machining operations on 3 different parts—

Automatically



A special Mercury 8-station center column milling and drilling machine mills joint face, ends, side face and babbit retention notch, and also drills mounting holes. The machine accepts three styles of diesel engine bearing caps, automatically senses and differentiates between the various types, withholding or actuating each head as the work demands. Production rate is 65 pieces per hour at 100% efficiency.

EMF

A SYMBOL OF FINE CRAFTSMANSHIP SINCE 1933

MERCURY — *Designers and Builders of Special Machines*

MERCURY ENGINEERING CORPORATION

Milwaukee 2, Wisconsin

Your Inquiry Is Invited

Chips lodged
in wiping materials
injure hands...damage parts...

...Another good reason for switching to **Scott Wipers!**

When a workman reaches for a clean, fresh Scott Wiper—he throws a *used* wiper and harmful chips away.

That means far less chance of injured hands and costly scratches and digs in finished parts.

Because they are available in quantity (125 to the box), a clean Scott Industrial Wiper is always at hand. Distribution and control is a simple matter and lost time waiting for wiping materials is greatly reduced.

Scott Wipers are two-ply and tough yet soft and absorbent. Compare them with whatever wiping material you're using now—for cost, for convenience, for performance.

The Scott representative or distributor in your area will be glad to help you set up a production-line demonstration in your plant. Call him or mail this coupon today.

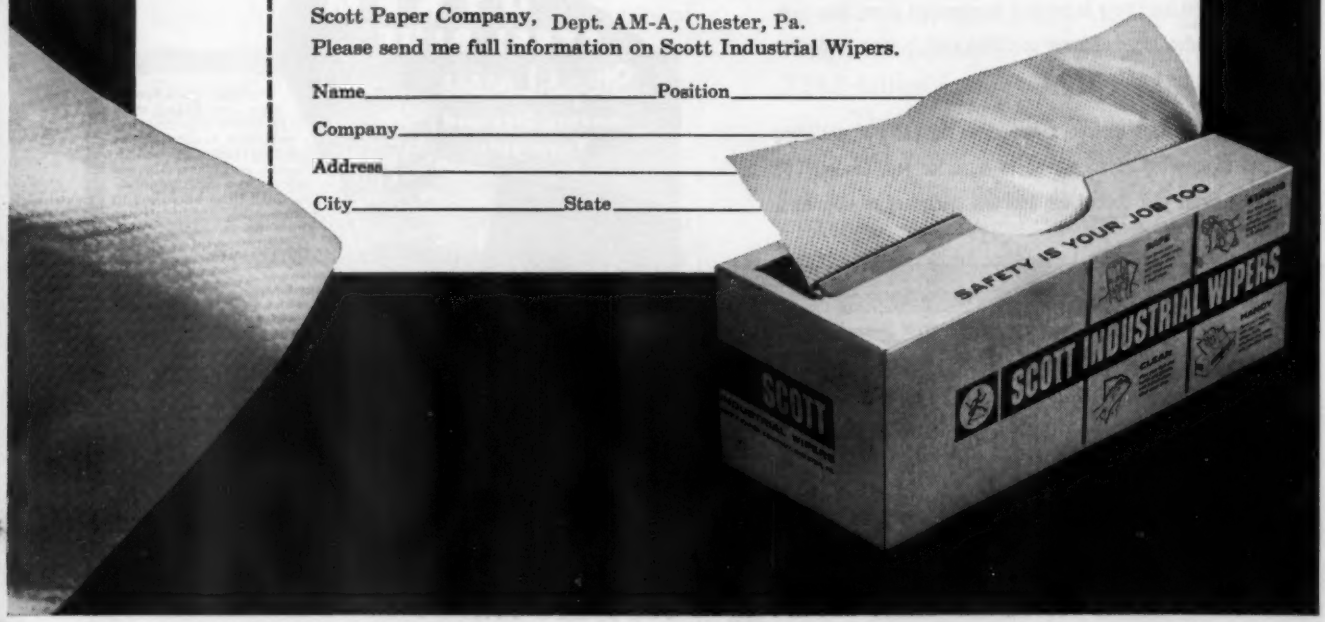
Scott Paper Company, Dept. AM-A, Chester, Pa.
Please send me full information on Scott Industrial Wipers.

Name_____ Position_____

Company_____

Address_____

City_____ State_____



production begins with

Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more-than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906
Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

SPLINE GAGES

MAYES spline gages are carefully controlled as to design, material, heat treatment, tolerance and finish to assure our customers of the best obtainable gage for the part inspected.

OTHER MAYES PRODUCTS

- MASTER GEAR
- INDEX PLATE
- BROACHES
- FIXTURE GAGES
- BUILT-UP GAGES
- POWDERED METAL DIES
- SERRATION DIES
- GEAR DIES

MAYES TOOL CO.
Designers & Manufacturers
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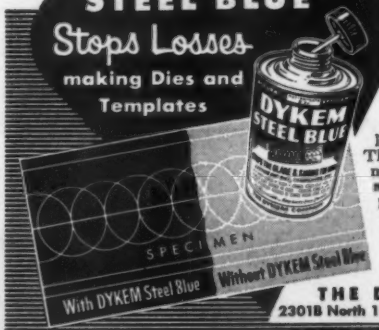
POPE PRECISION SPINDLES for Grinding, Boring, Milling
Belt Driven • Motorized • High Cycle • Special
Let us send you Data Sheets
POPE MACHINERY CORP., 261 River St., Haverhill, Mass.

DYKEM STEEL BLUE®
Stops Losses making Dies and Templates



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead
THE DYKEM COMPANY
2301B North 11th St. • St. Louis 6, Mo.

CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING
DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.
THE DYKEM CO., 2301-BNORTH 11TH ST., ST. LOUIS 6, MO.

A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SERIES

TO AMERICAN BUSINESS...

Thanks for Taming a Wild Horse

This is a message of appreciation to American industry. The occasion for the message is the completion of our eighth annual McGraw-Hill Survey of Business' Plans for New Plants and Equipment.

To a considerable degree, our appreciation is personal. It goes to the companies whose cooperation made our survey possible. Twice as many companies as in any previous McGraw-Hill annual survey carefully answered our questions about their plans to invest in new producing facilities. They gave a great deal of expensive time to the job. The cooperation of these companies, which employ nearly eight million workers, put the results of our survey on the firmest footing, in terms of coverage, it has ever had. For this cooperation we are most grateful.

But our appreciation is much more than personal. It extends in even greater degree to the kind of planning of investment in new plants and equipment which our survey revealed. The nature of this planning holds out promise that American industry is on the way toward bringing under control what historically has been one of the most upsetting forces in the American economy—the violent fluctuations in business capital investment. Progress in ironing out these fluctuations gives occasion for public gratitude.

A full report of the results of the eighth annual McGraw-Hill Survey of Business' Plans for New Plants and Equipment will be sent to anyone requesting it from the Department of Economics, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, N. Y.

Very Good Business News

The part of our surveys that attracts the widest interest is the news they give about immediate business prospects. And this year the news is very good. The survey results indicate that American business as a whole plans to invest $29.5 billion in new plants and equipment this year. That is 5% more than was invested last year, and a new high for any year.

Plans for the years 1956-1958 are also remarkably encouraging in terms of the amount of investment in prospect. American business reports that it is already planning to spend within 3% as much for new plants and equipment in 1956 as in 1955. In the past, the expenditures planned for future years have always been sharply lower than those planned for the current year. This is understandable enough. It is sometimes impossible to anticipate all the expenditures that will be necessary a year or more hence. Thus the fact that plans are already made

to spend almost as much in 1956 as this year is very good news about business prospects. The level of investment now planned for the years 1957 and 1958 is also remarkably high—far higher than ever reported for years that far ahead in previous McGraw-Hill surveys.

Taking the Long View

The fact that these plans exist is of immense constructive significance. It clearly indicates that more and more, and now in dramatic degree, American business is taking the long view in making its plans for capital investment. It is developing a program which, if successfully carried out, will go far toward eliminating the habitual, destructive surging and sagging of what is in effect the central power house of our economic system—capital investment by business. Upon the level of this investment depends not only the general state of our prosperity but our progress in raising the American standard of living with new products and new and better industrial processes.

Seven years ago, when we first asked industry to estimate its capital spending beyond the current year, only a small minority of companies could give us any estimates at all. This year, 87% of the cooperating companies—and it was a far larger number of companies—could comply with our request for estimates for the years 1956-1958.

It Pays to Bet on Growth

A number of developments help explain the increase in long-range planning of capital investment. One is the increasing technical complexity of American industry. It often takes longer, in this complicated age, to work out a successful installation of new plants and equipment. Another reason for long-range planning is American business management's increasing conviction that it pays to bet on the demonstrated capacity of the American economy to grow over the long pull. With this goes a corresponding determination not to let short-term business fluctuations upset individual company plans for growth through addition of new plants and equipment. An additional factor, and one of great and increasing importance, is the sense of public responsibility on the part of American business leaders who want to help prevent destructive swings in the levels of new investment.

It cannot be too strongly emphasized that there is still nothing automatic about the carrying out of these long-range plans for business spending. Actual expenditures are still governed in major degree by the general health of our economy. This is fully attested by the fact that the current business recovery has led to a substantial upward revision of the investment plans reported to us last fall when we made a preliminary check of plans for 1955. Either private economic excesses or a reversal of the recent improvements in federal tax policy could gravely upset realization of present plans. Fortunately, neither of these possibilities seems to be an immediate threat.

The very fact, however, that American business management has made these plans and will do its utmost to carry them out is a development of tremendous constructive importance for the American economy. It means that major efforts are being made to tame what historically has been an economic wild horse—the process of capital investment by business. Both for doing it, and for telling us about it in our annual surveys, we extend to American industry our sincere thanks.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

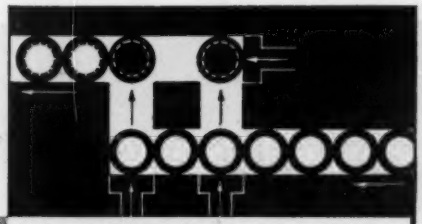
Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

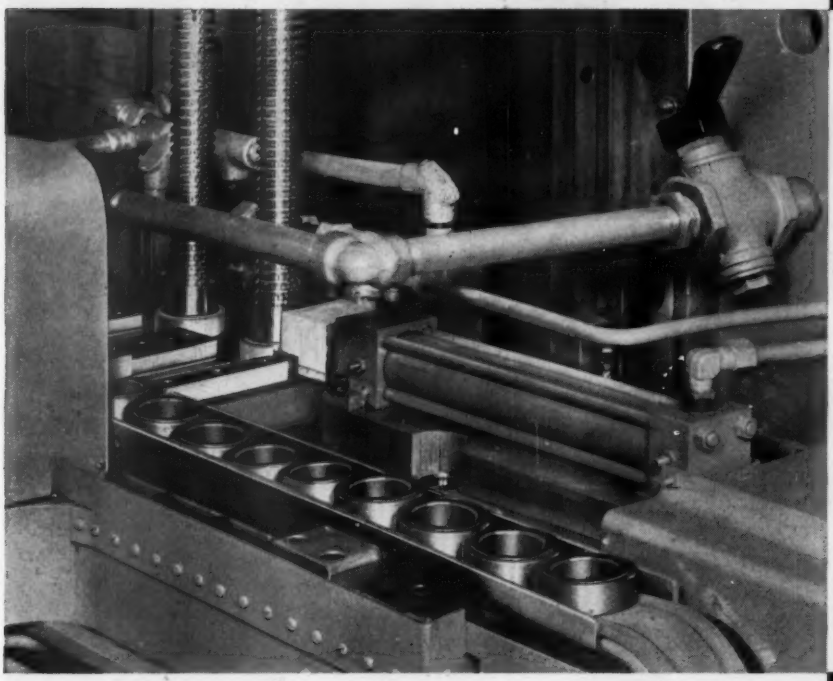
Donald C. McGraw

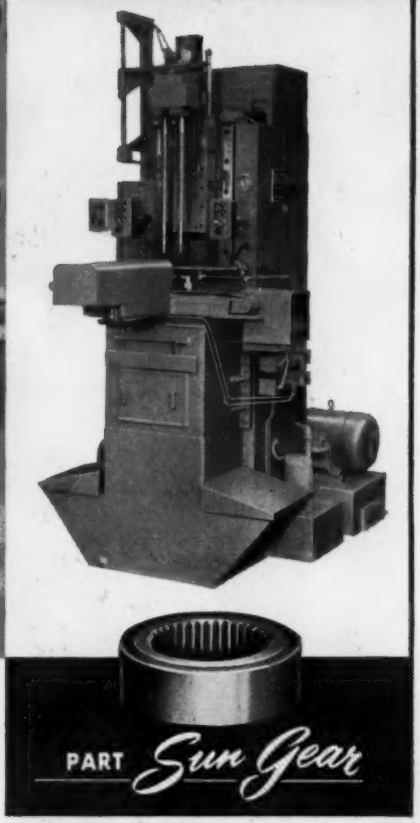
PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

AUTOMATION IN BROACHING!







DETROIT BROACH PROVIDES FULL AUTOMATION WITH FLEXIBILITY OF MANUAL OPERATION

In the designing and manufacture of automatic tooling for this Pull Down Internal broaching machine, Detroit Broach combined all the time and labor saving advantages of automation, plus versatility to permit efficient manual operation when required. This standard machine is designed to support the tail of the broach throughout the entire stroke and, if desired, may be arranged to hold the tool in tension throughout the cut.

On this particular job, parts are loaded, broached and unloaded automatically—maintaining consistent, high quality production WITHOUT AN OPERATOR! Parts are fed to the machine fixture and then carried away on a belt conveyor.

In addition, this machine features:

OPERATION
Broaching 39 involute spline teeth and size minor diameter

PRODUCTION
480 pieces per hour (100% hour)

MACHINE
Detroit Broach 10-ton Vertical Pull Down Broaching Machine with 42" stroke.

1. An automatic safety mechanism which must be actuated by both broaches at the top of the stroke before the unloading cylinder will eject the finished parts. This eliminates any possiblity of costly tool breakage and down time.
2. Should anything interrupt this machine's automatic cycle, an operator can step in and run full production manually until automatic cycle is resumed.
3. Use of standard components wherever possible to keep costs low and to assure simple, time-saving maintenance or replacement.
4. Fixtures designed and built for greatest flexibility . . . for easy conversion to hold other parts or for design changes on present parts.
5. Simplicity of design and construction for convenient accessibility . . . for quick, easy inspection and maintenance.

Why not find out how you, too, can benefit from new broaching techniques and tooling advancements. Our sales engineers will be glad to consult with you at your convenience.

Detroit Broach COMPANY
ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

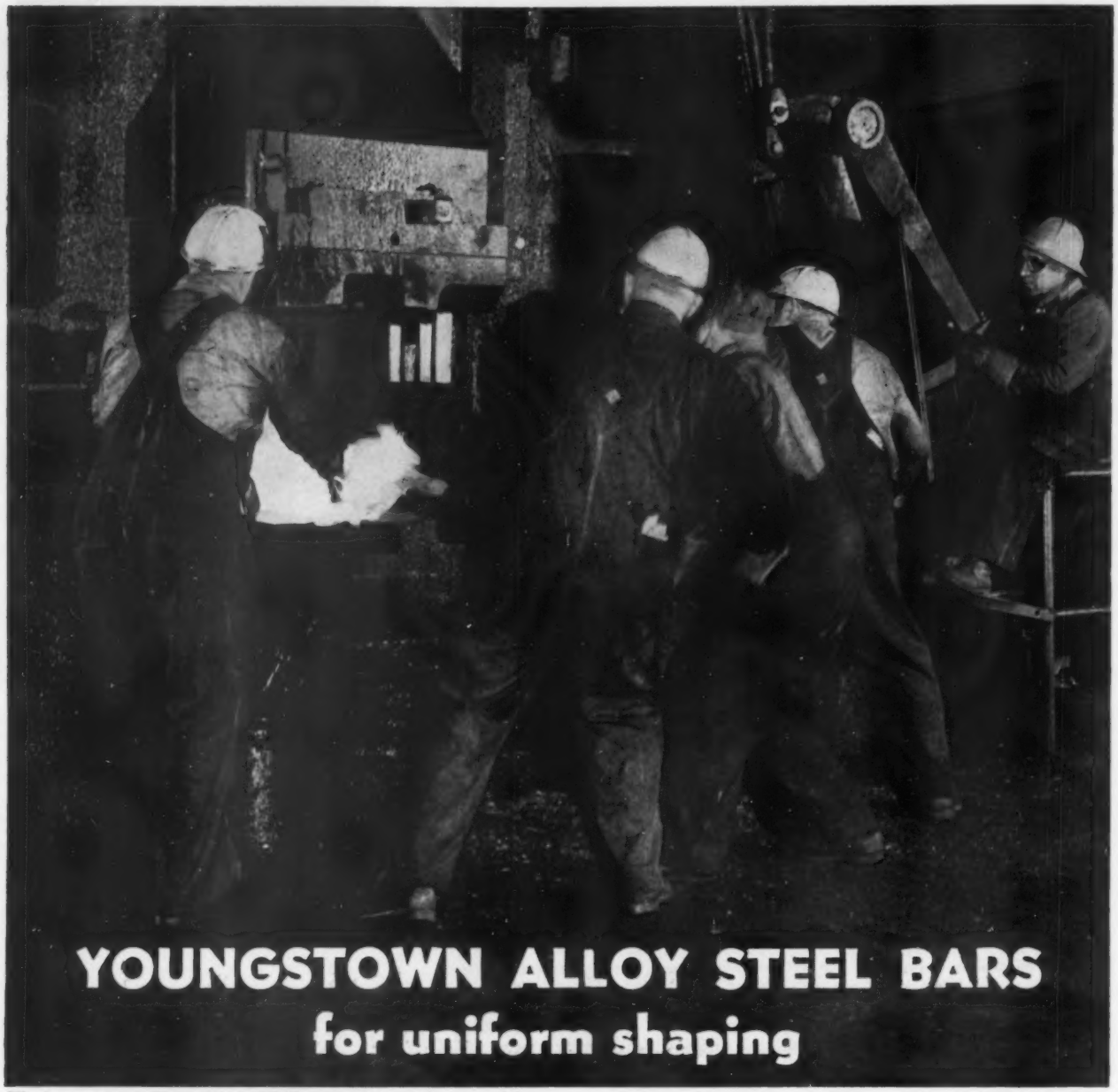


Photo courtesy Transue & Williams Steel Forging Corp.

SPECIFY

Youngstown

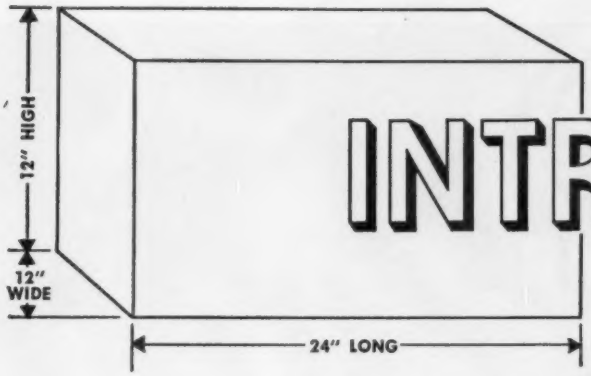
Hot Rolled QUALITY YOUNGSTOWN SERVICE Alloy Bars

●Quality control of Youngstown Hot Rolled Alloy Bars insures uniform chemical composition and mechanical properties, as well as uniformity of dimensions. These desirable characteristics result in minimum forging rejects and less loss in flashings.

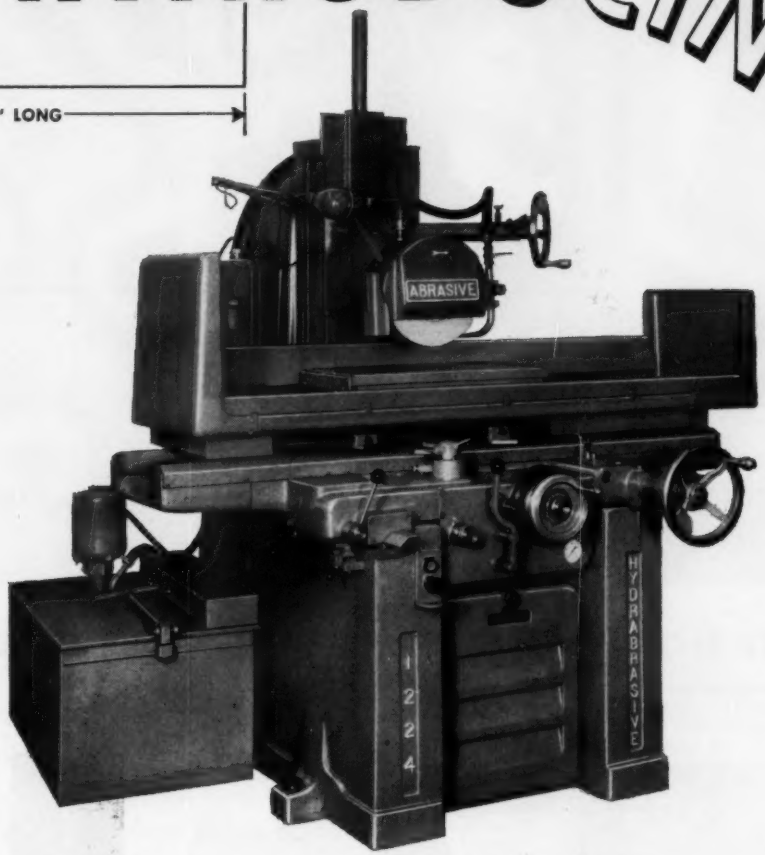
THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Stambaugh Building - - Youngstown 1, Ohio
Plants: Youngstown, Ohio; Struthers, Ohio; Indiana Harbor, Indiana

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS



INTRODUCING...



Famous Hydrabrasive quality, accuracy, and performance in a new size . . . the **No. 1224** hydraulic-feed surface grinder.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL CO.
8 Dunellen Road East Providence 14, R. I.

Send Bulletin 1224 describing new 12" x 24" x 12" Hydrabrasive Surface Grinder.

Get Details, Today!

Name.....

Company.....

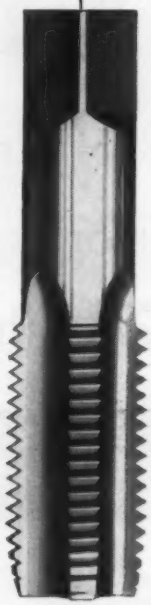
Address.....

.....

.....

BAY STATE

TAPS FOR PRODUCTION . . .



in all standard and special sizes . . . are available from your nearby Bay State Tap distributor. Gain precision performance on every tapping job with controlled contour taps, made by BAY STATE TAP & DIE CO., MANSFIELD, MASS.

"WE CUT PRODUCTION COSTS WITH THE SURFINDICATOR*!"

PRODUCING PRECISION PARTS is a requirement at Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. Thus, the company uses the Brush SURFINDICATOR to check surface finish on pumps, presses, valves, and cylinder parts. A regular inspection tool, the SURFINDICATOR is used 20 to 50 times a day.

HPM reports, "dollar savings in production resulting from use of the SURFINDICATOR." Inspection is speedy, accurate, definite. The human factor in estimating surface finish is eliminated.

The SURFINDICATOR, priced from $685, is an invaluable inspection tool for any plant that must produce parts to specified finishes. You can meet specifications exactly—eliminate costly over-finishing, end guesswork. Let a Brush representative demonstrate the SURFINDICATOR in your plant—no obligation.

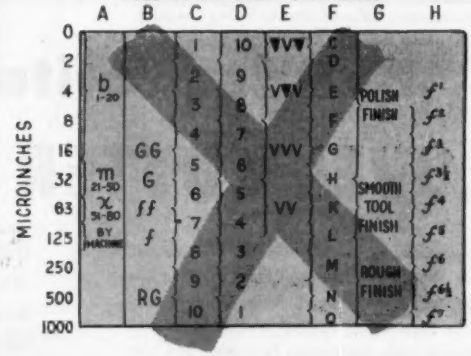
*Trade-Mark

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZOELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT AND COMPONENTS

Division of Clevite Corporation

VARIETY OF SURFACE SPECIFICATIONS USED BY DIFFERENT COMPANIES



New Standard Eliminates Confusion in Surface Specifications

These individual methods of specifying surface finish can now be replaced by one uniform system with the new ASA and MIL-10 Standard. The Brush SURFINDICATOR is the only instrument completely meeting the new Standard.

Brush Electronics Company, Dept. U-6A
3405 Perkins Avenue, Cleveland 14, Ohio

☐ Please send booklet describing New ASA Standard B46.1, and illustrating SURFINDICATOR.
☐ Have your representative call.

Name _____

Position _____

Company _____

Address _____

City _____ *State* _____

Photo courtesy Deluxe Cutter Grinding Company

Builds profitable business with six COVEL CUTTER AND TOOL GRINDERS

Above: Grinding cutting edge on 6" face mill, at DeLuxe Cutter Grinding Company, using fine wheel to produce smooth finish. Other typical operations include making special tools from standard tools, sharpening face mills, end mills and a wide variety of other tools.

Get full details—send for Bulletin AM-135. Also ask about Covel No. 12A Universal Cutter & Tool Grinder which has Pope Tilting Head with motorized 1 h.p. spindle.

DELUXE CUTTER GRINDING COMPANY, DETROIT, has an enviable reputation for service—*fast* service—in the highly competitive business of sharpening and salvaging tools and making special tools—thanks to its Covel Cutter and Tool Grinders. Its first Covel, put into operation eight years ago, proved so fast, accurate and dependable that DeLuxe Cutter Grinding Company now has six Covels busy meeting a constantly growing demand. No major repairs have ever been necessary, no spindles have had to be replaced.

This is another of the many examples of how Covel Cutter and Tool Grinders can improve *your* competitive position, *too*—whether you grind tools for others or for your own use. So, why not standardize on Covels? You'll be money ahead!

COVEL PRECISION GRINDERS | **BENTON HARBOR MICHIGAN**

HYDRAULIC & HAND FEED SURFACE GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS

Machining costs are 25% lower

This valve is used for a fuel return regulator check. Although the manufacturer was one of the first to use Carpenter Stainless No. 8 (Type 303) when it was first introduced, there have been occasions and conditions which required the use of ordinary makes of Type 303 Stainless Steels. The customer reports: Carpenter No. 8 *consistently* enables them to show a 25% saving in machining costs because of its constant uniformity and easier machinability.

Reject rate is reduced

An important requirement of this valve is that it be "leak-proof" in operation under pressure. To assure a tight seal, some surfaces are machined to a 5 or 10 micro-inch finish with tolerances as close as .0005". Because of the machinability and finishes obtained with Carpenter No. 8, rejects always take a sharp drop when compared with competitive Type 303 Stainless Steels.

Machine operators are happier

Here's an interesting sidelight: Machine operators can always spot an ordinary Type 303 without being told, because of the way it cuts in the machines. With Carpenter No. 8 they tell us they *know* the job will run smoother and faster with improved results. The same thing can apply in your *own* plant. So if you're looking for a way to improve performance and reduce costs on your stainless parts, CHANGE to Carpenter No. 8. See what the difference can mean to you. THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.

take the problems out of production

...change to Carpenter STEEL — **Free-Machining Stainless**

IMMEDIATE DELIVERY from local warehouse stocks!
Export Department: The Carpenter Steel Co., Port Washington, N.Y.— "CARSTEELCO"

Which will it be—?

Price

Cost

As you well know, *price* of new equipment is only the beginning. Actual production savings determine real equipment *cost.*

From this realistic *cost* standpoint you can't beat Erickson collet chucks. Here's why:

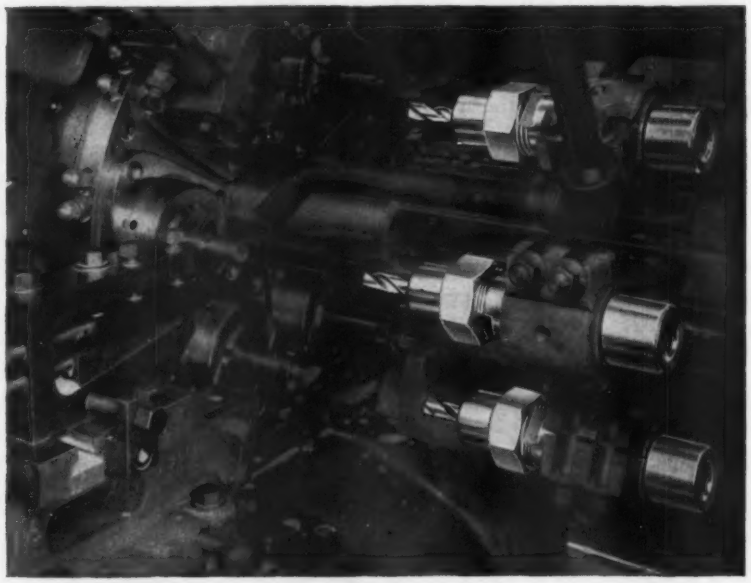
Guaranteed accuracy of .0005" and superior gripping power of Erickson collet chucks assure proper drill alignment. Drills then cut evenly on both cutting lips permitting faster machine feeds and proper speeds . . . give more holes per grind.

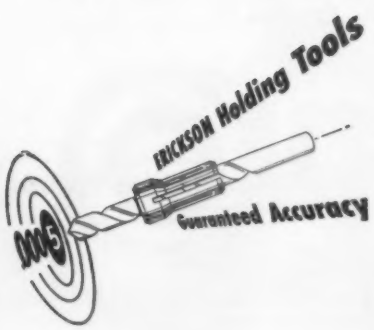
What's more, ease of operation greatly reduces set-up time and since Erickson chucks can grip on the flutes, you can stub your drills . . . extend tool life . . . maintain accuracy.

Send for new Catalog K today! It gives the complete Erickson story. You'll find many interesting applications for all Erickson holding tools.

A-9592

ERICKSON TOOL COMPANY 2309-6 Hamilton Ave., Cleveland 14, Ohio





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TAP CHUCKS • TAP HOLDERS • AIR-OPERATED
CHUCKS • EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

Points FOR BETTER FASTER GRINDING

America's most popular

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Chicago Wheel

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We Invite You to Test These Mounted Wheels Without Charge

Chicago mounted wheels will save you time and money on virtually every type of grinding and finishing job. They grind faster and last longer. A complete selection of abrasives, grain sizes, grades and bonds is available. Chicago mounted wheels are perfectly balanced, and guaranteed to remain on their mandrels. Millions are now in use daily in tool rooms, machine, pattern and die shops, foundries, and other plants. No other tool can do the job of Chicago Wheel mounted points.

There are over 200 different shapes and sizes. Convince yourself, test these remarkable wheels soon.—Write for sample Chicago mounted wheels available to you without charge.

CHICAGO WHEEL & MFG. CO.

Dept. AM, 1101 W. Monroe St., Chicago 7, Ill.

MANUFACTURERS OF ABRASIVE PRODUCTS, "HANDEE" PORTABLE GRINDERS, GRINDING WHEELS, AND MOUNTED WHEELS AND POINTS FOR INDUSTRY.

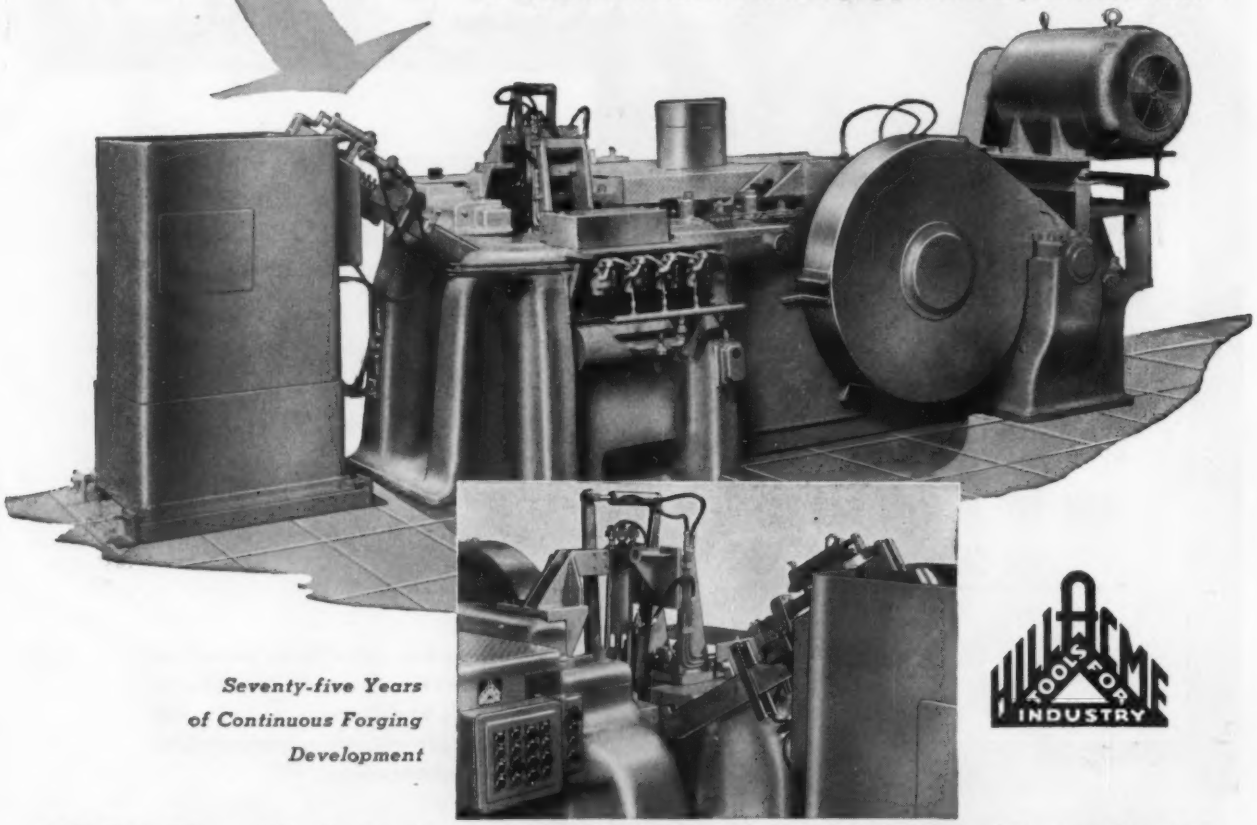
ACME MODEL XN

produces 2,400 completed forgings per hour!

A standard 3" ACME XN forging machine is producing, in multiple operations, a completed forging with every stroke of the machine in the plant of a large automotive manufacturer. Continuous operation with an automatic feeding device makes this amazing production possible.

PHENOMENAL SAVINGS

The increase in output through continuous operation of this ACME XN forging machine results in savings which are not only impressive but approach the incredible. The ACME XN with automatic feed is adaptable to either single or multiple operation forging. Every job, of necessity, calls for special design in the feed mechanism depending upon the shape, size and weight of the material involved. ACME XN forging machines are made in capacities from 1" to 5". We would like to discuss YOUR forging problems at your convenience.



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DISSTON STAINLESS STEEL

...hot rolled to SHAPE

saves steel · tooling · machining

Stainless steel users receive many advantages by ordering Disston steel shapes accurately rolled to their specifications.

LESS MACHINING. Tool operations are simplified, for Disston shapes are rolled to precision tolerances, have exceptionally fine finishes.

REDUCTION IN WASTE MATERIAL. Preshaped Disston steel reduces scrap losses. One well-known manufacturer saved 47% of stainless steel tonnage by starting with a rolled Disston shape—instead of a rectangular section.

LOW-COST HANDLING OF SMALL ORDERS. Jobs as little as five or ten tons on a particular shape are rolled easily, economically in the Disston mills. Over 100 years of leadership in the rolling of special shapes gives Disston the edge in metal-shaping skill and technique.

Why not talk over your requirements with a Disston representative? Learn how much you can save by using Disston stainless steel shapes. Or write to:

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620 Tacony, Philadelphia 35, Pa., U.S.A.

DISSTON HAS THE EDGE®
in special purpose steels
and special steel shapes.

100 YEARS OF FINE STEEL MAKING

Operators of Brown & Sharpe Grinders get ~~better~~ BEST production when modernized with Whitnon Spindles

Whitnon Spindles are ~~better~~ BEST because they're anti-friction grease lubricated, sealed at assembly, precision balanced on own bearings, completely interchangeable, designed to fit present wheels

Equip your present or new Grinders with WHITNON SPINDLES — they're made to last longer.

Write today for price and prompt delivery.

Now stocked for

#1, 2, 3, 4 and #11 Universals
#2 and 5 Surface Grinders
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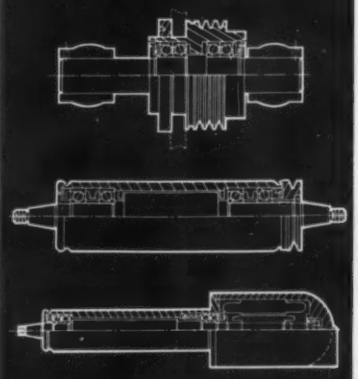

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The Most significant advance in a quarter Century of HEIGHT GAGE DESIGN

EASY READING 2-1/2" LONG VERNIER

RAPID QUICK ADJUSTMENT

TOP VIEW

TRIANGULAR SCALE BEAM for Superior Strength and Rigidity, preventing sway and vibration.

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When you're looking for an idea and the answer is at your fingertips, your source material is "as good as gold." Thousands of production - conscious metalworking men throughout the nation share this experience and opinion when they refer to their 1955 PRODUCTION PLANBOOK issue of *American Machinist*.

To find the idea you need, investigate today the more than 2,000 production "nuggets" in *your* copy of our 1955 PRODUCTION PLANBOOK.

American Machinist
McGraw-Hill Building
New York 36, N. Y.

How efficient is YOUR shop?

Over 42 per cent of metalworking production equipment is now over ten years of age . . . 19 per cent of it was bought more than 20 years ago!

This means that there is more over-age and obsolete production equipment operating in metalworking shops now than in 1945, and the rate of obsolescence is growing.

How about your shop? Are you equipped adequately with the modern, high-efficiency machinery and equipment which alone can produce the better products that cost *less to buy* which everybody wants? How does your shop compare with those of your competitors, and with metalworking shops generally?

You can find out quickly by writing for a copy of the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Here are all the facts on the age and number of 155 major types of production equipment, operating in 15 manufacturing divisions and 25 major production areas. Price: $2.00 per copy.

American Machinist

Reader Service Department

McGRAW-HILL BUILDING
NEW YORK 36

See why Tool Engineers call these heavy producers,

"MOST MODERN MACHINES OF THEIR TYPE"

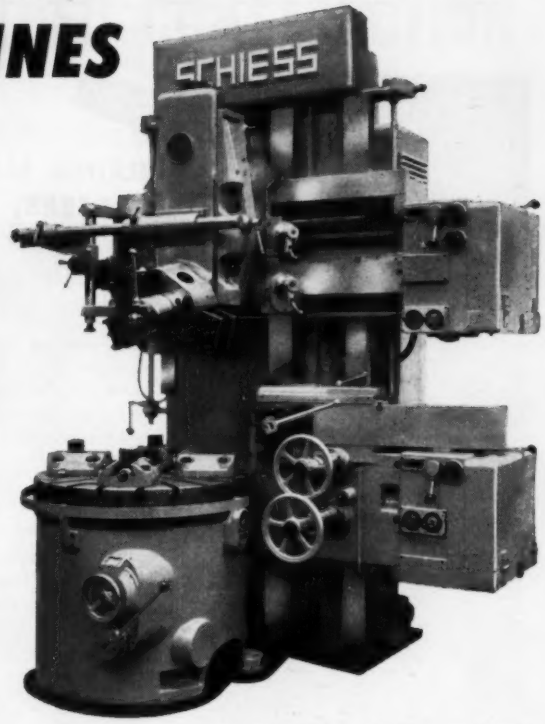
Hydraulic pre-selection of speeds set by handwheel and read on illuminated dial. 16 spindle speeds—ratio 1:50—up to 310 rpm for carbide machining on Model KE 100. Table runs on tapered roller bearings.

Fingertip control for direction of feed and rapid traverse with spring-loaded mono-levers for normal direction plus angular compound feeds. Mono-levers move in same direction as desired feed or traverse movement, simplify correct setting by operator. Specially designed electro-magnetic disc clutches disengage feed instantly with no over-riding or coasting.

Counterbalanced cross rail and side head. Single lever unlocks, raises or lowers, and locks cross rail simultaneously by electro-mechanical controls. *No bolts or nuts to loosen or tighten by hand.*

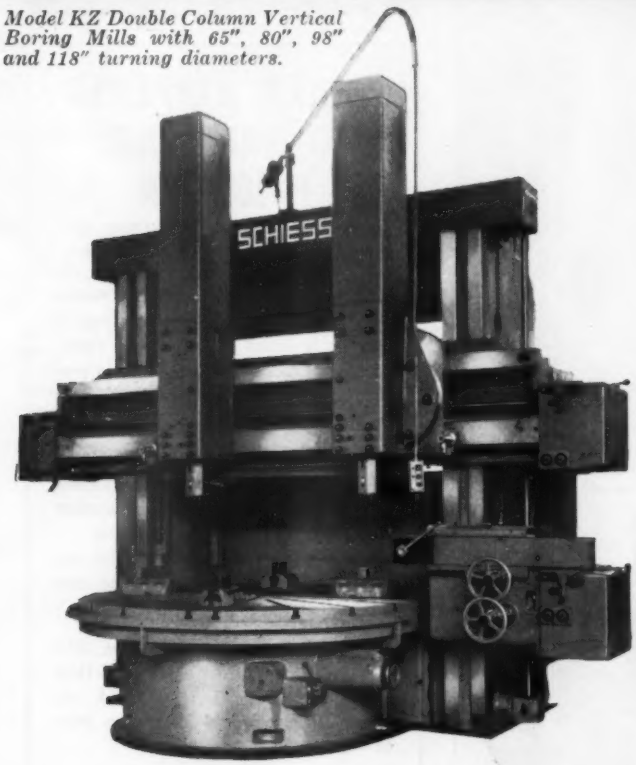
All-vertical gear drive with main motor mounted on back of machine, directly connected to gear box. Changes in direction of drive transmitted to table without bevel gears, eliminating vibration and backlash.

Copying attachment with electric tracer for use either on cross rail or side head.



Model KE Single Column Vertical Turret Lathes with 40", 50" and 65" turning diameters for high-speed carbide machining.

Model KZ Double Column Vertical Boring Mills with 65", 80", 98" and 118" turning diameters.



All operating features of KE Series Vertical Turret Lathes are combined in

SCHIESS KZ DOUBLE COLUMN VERTICAL BORING MILLS, PLUS—

Heads equipped with steel octagon rams can be swiveled—have automatic feed in vertical, horizontal and angular direction and are independent of one another as to amounts and direction of feed. Table operated by three-button pendant control. Standard model KZ Double Column Vertical Boring Mills are available with 65", 80", 98" and 118" turning diameters.

Get to know these products of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on these and all Schiess KE machines.

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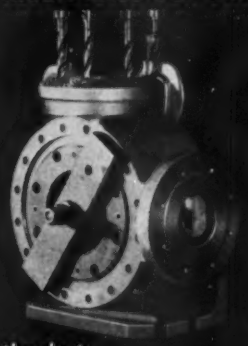
DRILLS 7% MORE GRAY IRON VALVE BODIES PER SHIFT



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Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 11, Niagara Falls, N.Y. 64-51

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WHAT'S HAPPENED TO WAGES AND PRICES IN METALWORKING?

A comparison of '54 and '53 average wages and prices, plus the percentage of change, is listed for all major manufacturing groups of this industry in your 1955 PRODUCTION PLANBOOK issue of *American Machinist.*

Many other facts and figures in the PRODUCTION PLANBOOK's *economic report* can help you judge the amount of business you can expect this year . . . how much your payroll may rise or dip . . . give you many more clues to your firm's probable profit picture.

Even more valuable to you are the 1955 PRODUCTION PLANBOOK'S more than 2,000 production "nuggets" and the data-crammed special report on *How to Work Steel.*

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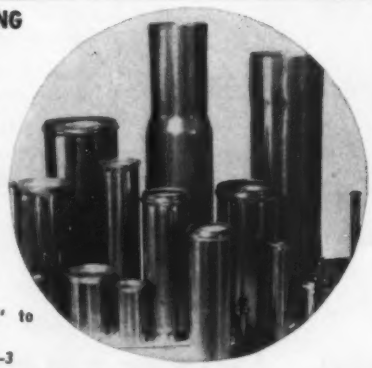
YOU CAN MEET EVERY TUBE-END FORMING NEED . . . with VAILL EQUIPMENT

Designers, Equipment Engineers and Production Men are finding it to their advantage . . . in terms of better products at lower cost . . . to use formed-end tubes in their products wherever possible. And they are finding VAILL Machines the economical equipment to use to cut costs and speed such operations as: beading, flaring, expanding, reducing, sinking, swaging, grooving, double-lap flaring and flanging.



VAILL offers a complete line of air-hydraulic and mechanical-operated machines to shape and form ends of ⅛" to 4½" diameter tubes.

Write for General Bulletin G-3

THE VAILL ENGINEERING COMPANY

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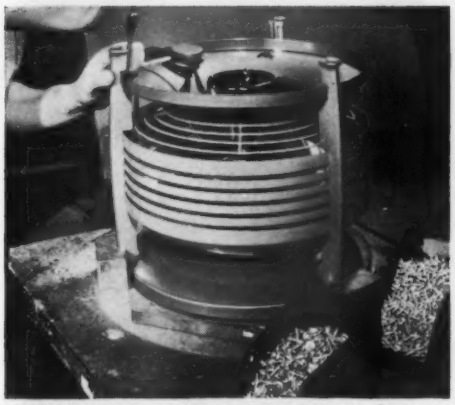
STRONGER, SAFER, STREAMLINED CONSTRUCTION

...with Phillips Cross-Recessed-Head Screws



"ASSEMBLY IMPROVED IMMEDIATELY when we began using Phillips screws," relates the assistant purchasing agent of Fasco Industries, Rochester, N. Y., leading makers of shaded pole motors, blowers, fans and ventilators. "Now we can use mechanical drivers that save plenty of time. Burring seldom happens any more. Product appearance couldn't be better. Whether inside for extra sturdiness, or outside for extra dressiness, we use Phillips screws almost exclusively!"

MORALE AND PRODUCTION SOARED with changeover to Phillips screws, which now comprise more than 92% of all screws used at Yankee Metal Products Corporation, Norwalk, Conn. Makers of auto lamps, mirrors and safety equipment since 1915, Yankee depends on many types of Phillips heads — both unplated and chromed to match accessories. Yankee's Merchandising Director says happily, "Phillips screws for extra safety, speed and ease of use really build plant morale and incentive earnings!"

EXTREME ANGLES NO PROBLEM where tightness is vital as in this fan assembly built by leading small motors manufacturer A. C. Gilbert of New Haven, Conn., to withstand lifelong vibration. Single-slot screws proved treacherous and expensive in time and damage loss. An executive engineer for Gilbert says, "Using Phillips screws for over 10 years, we have learned that, for all around production efficiency, Phillips are the best."

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

THE FASTENERS OF TODAY
...AND OF THE FUTURE

X marks the spot

... the mark of extra quality

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Blake Tapsaver Flute and Chamfer Grinders

Taps sharpened the Blake way have:

- EXACT Rake Angles — predictable and repeatable every time.
- EXACT Indexing of successive cutting edges.
- EXACT Chamfer, with correct relief each sharpening.

RESULTS

- GREATLY INCREASED tap life.
- MAXIMUM PRODUCTION of in-tolerance threaded holes between grinds.
- SUBSTANTIAL SAVINGS in the cost of tapping operations.

and here's the Proof

Write for these booklets

EDWARD **BLAKE** COMPANY

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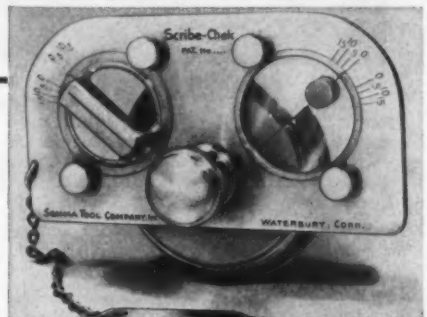
BLACK DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS

Scribe-Chek

CUTTING EDGE GAGE . . .

- Simple operation, even inexperienced men can sharpen tools properly.
- Eliminates costly "cut and try" tool Sharpening methods—pays for itself many times over.
- Gives longer tool life and therefore more correct pieces per grind.
- Inexpensive—High Precision Instrument.



SCRIBE-CHEK . . . TAKES THE GUESSWORK OUT OF SHARPENING CIRCULAR FORM TOOLS.

At last . . . a Gage to eliminate your tool sharpening problems. No more trusting the human eye — with the Scribe-Chek gage you can scribe the exact cutting edge required on the tool (with or without top rake) and also visually check the result after sharpening.

West Coast Warehouse: 576 No. Prairie, Hawthorne, California

SOMMA TOOL COMPANY Inc.

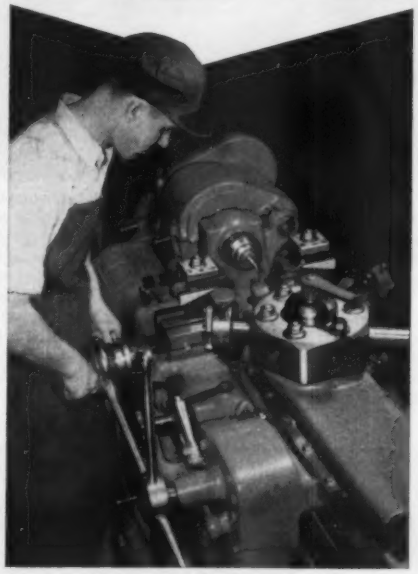
Manufacturers of Standard and Special Precision Form Tools

22 BROWN STREET • WATERBURY, CONN.

A Better Value

SOUTH BEND

2-H TURRET LATHES



South Bend 2-H Turret Lathes have the stamina for exacting close-tolerance work, rigidity for producing fine finishes and ample power for smooth performance. Gear box provides 48 power feeds each for turret ram, universal carriage and double tool cross slide. Such a wide selection of feeds insures all-job range. Where can you find a better turret lathe value? Write for information on this fine machine.

SPECIFICATIONS

Spindle Hole—1⅜". **Collet Capacity**—1". **Swing**—16¼". **Spindle Speeds**—20 to 945 r.p.m. **Turret Feed**—5⅞". **Dia. Turret Holes**—1½". **Thread Range**—4 to 224 per in. **Motor (2-speed)**—2, 1 h.p.

▶ **$3190** Illustrated, less electrical equipment and tooling, f.o.b. factory. Low down payment. Only 3¼% interest on original unpaid balance due.

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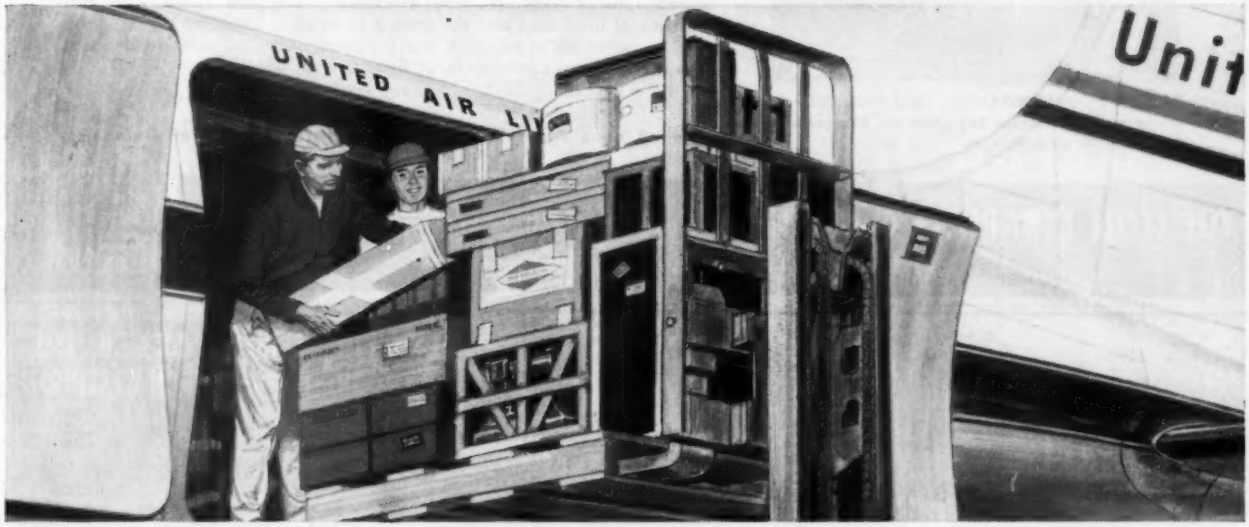

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With the Barrett Whizo Galvanizer, excess metal is quickly removed from small parts after dipping in molten metal, in fact, much faster and more uniform production is assured. Parts will also pass the most rigid inspection for quality.

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A quick pick up to full speed and stop (from 2 to 3 seconds each) assures maximum production with an even thickness of coating.

Machines furnished with or without heated surrounding drum, in capacities from 40 to 240 loads per hour, handling from 5 to 100 lb. loads. When used for tinning threaded work, rethreading has been found to be unnecessary.

Barrett Centrifugals are used extensively, combine speed with convenience of operation and the utmost in safety. They are highly developed to meet all reasonable requirements, have self-contained motor drive and occupy a minimum of floor space.

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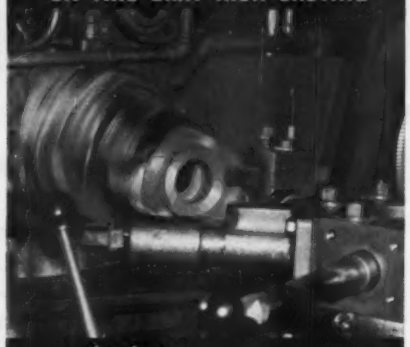

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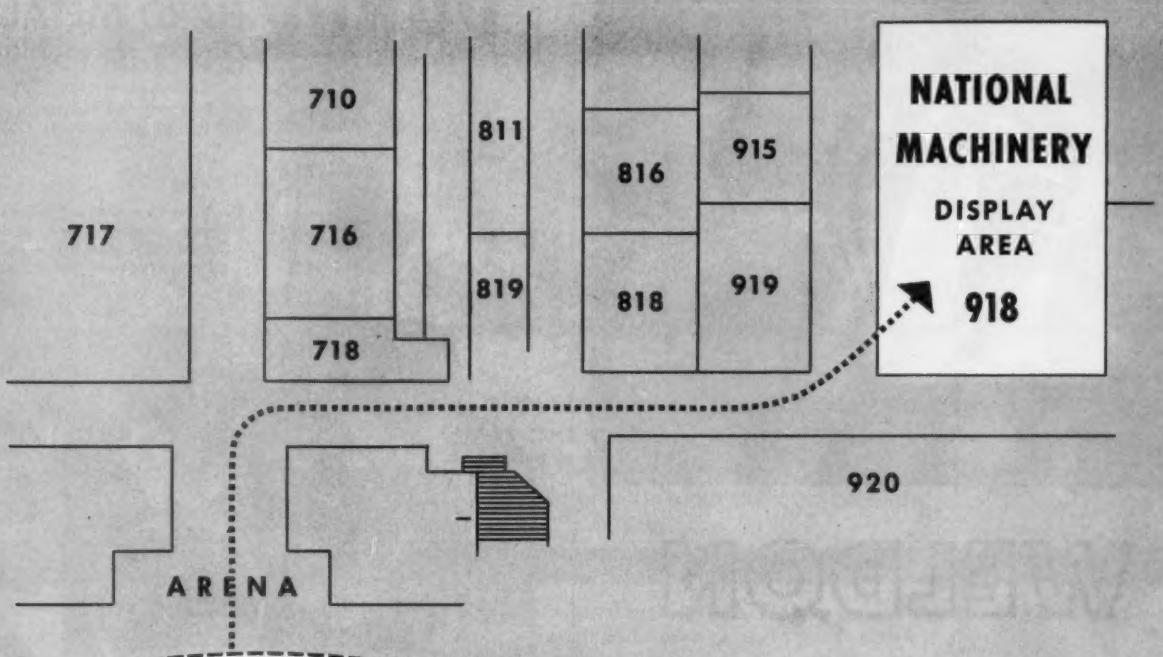

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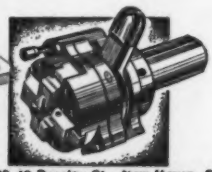

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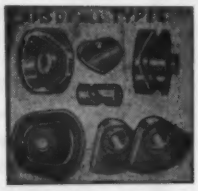

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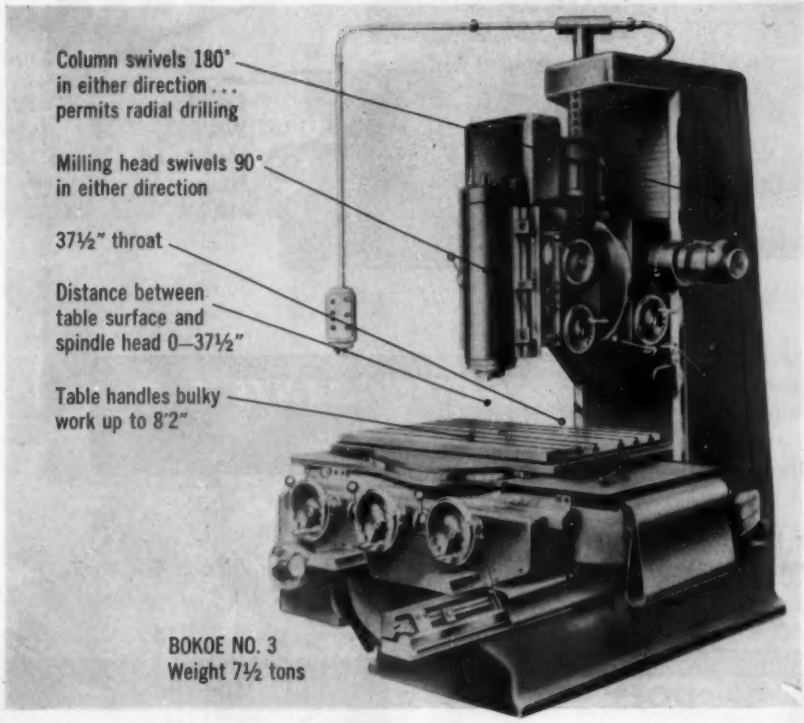
Column swivels 180° in either direction... permits radial drilling
Milling head swivels 90° in either direction
37½" throat
Distance between table surface and spindle head 0—37½"
Table handles bulky work up to 8'2"
BOKOE NO. 3
Weight 7½ tons

No other single machine performs such a variety of machining operations—many in one set-up—as are now possible on the revolutionary new BOKOE NO. 3 Universal Milling and Boring Machine ... for non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances. For no other machine combines all these versatile features—

Large work table and deep throat handles many jobs in one set-up. Easily accessible for bulky parts up to 8'2" dia.; distance between column slide and spindle center 37½". Automatic controls on work table provide 28" traverse and 55" longitudinal movement; table feeds infinitely variable from 4" to 39" per minute.

Continuous circular milling with automatic power feed for circular movement of work table infinitely variable from 7" to 70" per min.

Variable speed changer with spindle speeds from 36-1800 rpm can be operated without stopping machine.

Swiveling column turns 180° horizontally in either direction ... permits radial drilling in addition to vertical milling, universal milling and boring up to 11⅞" with large milling slide; six mechanical feeds and rapid travel.

Milling head on column swivels vertically 90° in either direction; table feeds are infinitely variable in longitudinal, transverse and rotary directions.

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How Motor Patterns Co. speeds production... saves man hours with 3 BOKOE No. 2 Millers

"With the variable speed changer, we don't have to stop the Bokoe mill in the middle of cutting operation," says Frank J. Oklessen, General Manager.

"The length of table travel has been a salvation to us on many jobs which formerly required two set-ups. The power-driven turntable gives us lots more working height than the usual portable turntable on ordinary millers.

"We also use it as a radial drill. By turning the swivel column 180°, we can bore holes in a large, heavy casting on a skid on the floor.

"The 3 Bokoe mills in our plant have enabled us to do better work faster and more accurately on aluminum and cast iron work because the machine is so versatile. That's why we've added the Bokoe No. 3 for milling steel.

"Your service on parts and cutters has been wonderful."

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Motor Patterns Co., Cleveland (3)
City Pattern & Machine Co., Detroit
Progress Pattern Co., Pontiac, Mich.
Ford Motor Co., Dearborn
Convair, San Diego, Cal. (3)
Packard Motor Car Co., Detroit
Industrial Pattern Works, Chicago

BOKOE NO. 3

Motor Patterns Co., Cleveland
Standard Products, Clinton, Ohio
Pattern Makers, Syracuse
City Pattern, Detroit (2)
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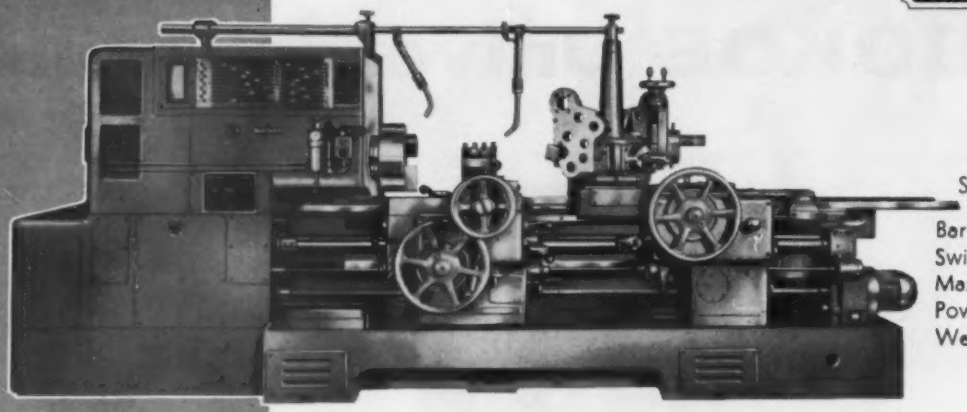

Spindle bore	2 1/4"
Bar capacity	3" - 3 3/4"
Swing	16 3/4"
Max speed	rpm 1500
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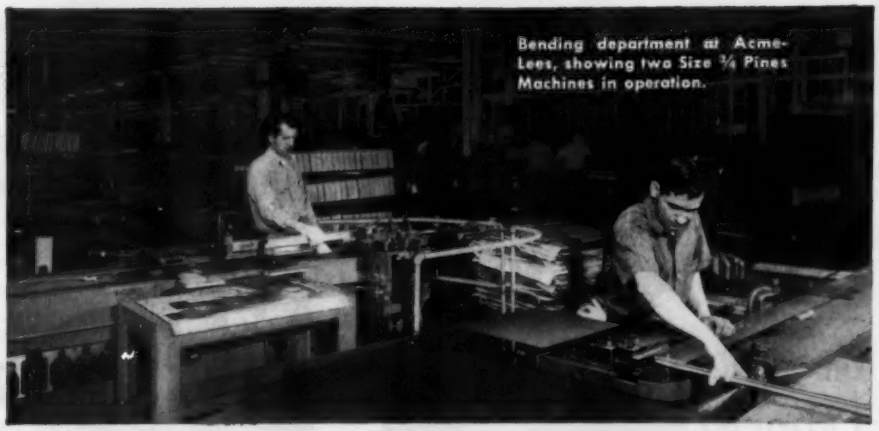
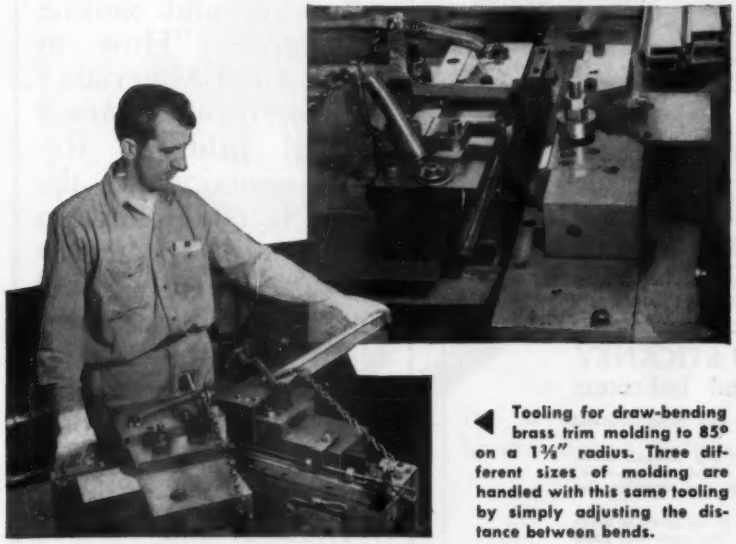


Bending department at Acme-Lees, showing two Size ¾ Pines Machines in operation.

◀ Tooling for compression-bending stainless steel trim strips. First and fourth bends are located from a hinged stop on the swinging arm; second and third, from stops on top of machine.



◀ Tooling for draw-bending brass trim molding to 85° on a 1¾" radius. Three different sizes of molding are handled with this same tooling by simply adjusting the distance between bends.

SKILLFUL TOOLING PRODUCES SMOOTH 1½" RADIUS BENDS IN .020" TYPE 430 STAINLESS STEEL

Here's a typical result story indicative of the bending skill of Acme-Lees Division, Muncie, Indiana, specialists in fabricating decorative trim moldings and extruded shapes for Appliance and Automotive Manufacturers. On a Size ¾ Pines Automatic Bender, .020" Type 430 stainless steel trim moldings are now formed with four unusually smooth 90° bends to a 1½" radius. Production speed is today 58% faster than by former manual bending methods. Current production is rated at 456 bends per hour as compared to 288 by manual methods.

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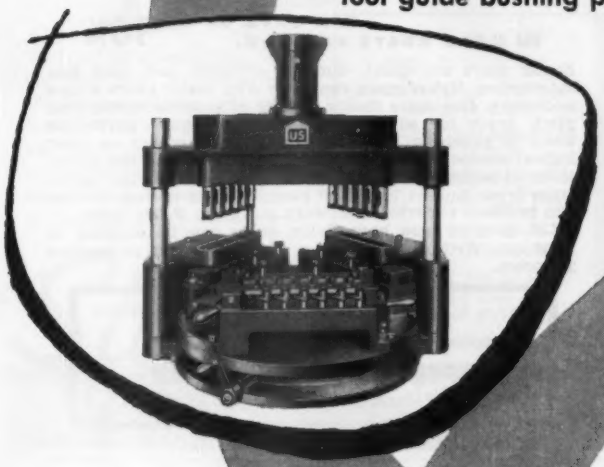
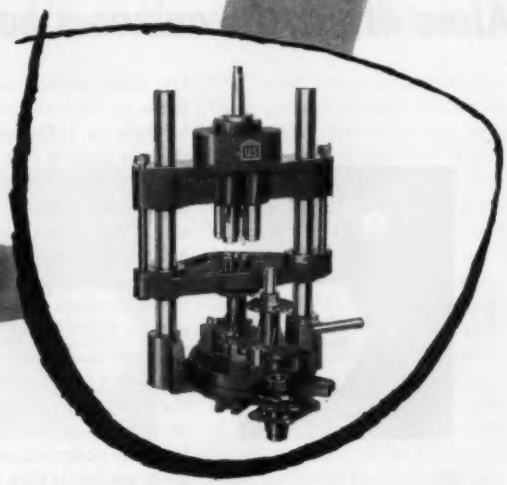
The 12-spindle unit shown below has a three-station hand-indexing table with three holding fixtures, complete with tool guide bushing plates.





Shown above is a drill head complete with boring bars with Carboloy-tipped cutters and Stellite wear strips. The indexing table has necessary holding fixtures with bushing guide plate.

The setup, left, has a two-position, hand-indexed fixture.

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

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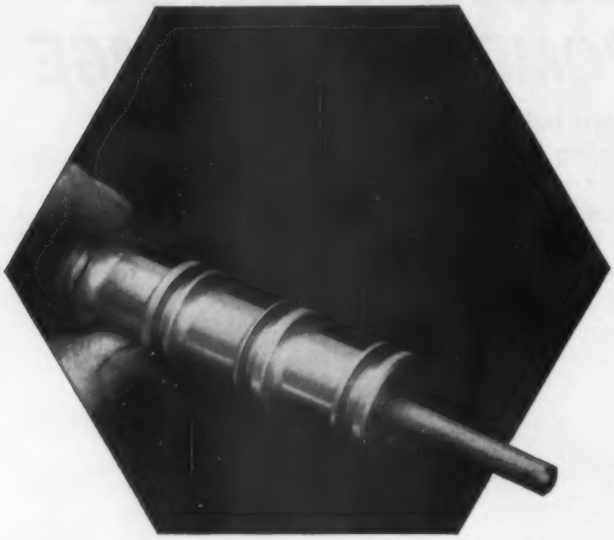
There is a right way to deep drill this aluminum part



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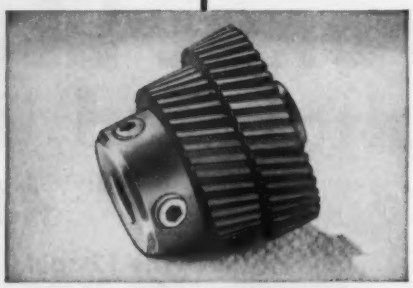

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Nylon gears are quiet, durable, efficient and need less lubrication. Nylon gears can mate with metal gears where necessary. Our more than a decade of manufacturing fine pitch gears for some of the country's most particular users of precision and commercial gears makes us your logical source for Nylon gears. We can mold large quantities at savings up to 90% and we can cut smaller quantities from molded blanks at proportionate savings. Or we can produce experimental work cut from Nylon bars.

Let us show you how Nylon gears can be adapted to your use. Write today, sending full details for estimating purposes.

102

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PROCESS GEAR CO., INC.
4614 W. Fullerton Ave. • Chicago 39, Illinois

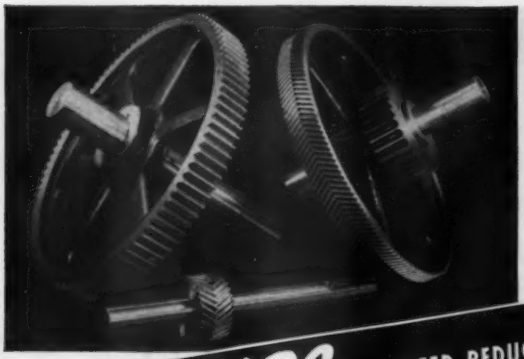
HOW TO SAVE $300,000 A YEAR ON EXTRUSION SCRAP ALONE!

Convair, San Diego, does so. The secret? It lies in ordering extrusions in lengths more closely suited to production requirements: the mill makes no charge for cutting if the order exceeds 100 lbs. Scrap ends can be reduced from feet to inches by proper planning.

You can plan on big savings, too, if you make a habit out of reading your 1955 PRODUCTION PLANBOOK issue of *American Machinist*. Hundreds of case histories like the one listed above are found in the "nugget" sections of this issue.

Mine this rich vein of information now. Read it thoroughly and keep it handy for regular reference.

American Machinist
McGraw-Hill Building, New York 36, N. Y.



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Illustrated are speed reducer assembly table gears for use in rolling mill machinery. Made right, of the finest materials, these gears give meaning to Stahl's long-standing reputation for producing gears to exact specification—economically and on time. Get Stahl's estimate first!

SPURS TO 72" PD, 1 DP
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RACKS TO 20 FT. LONG, 3 DP
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HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

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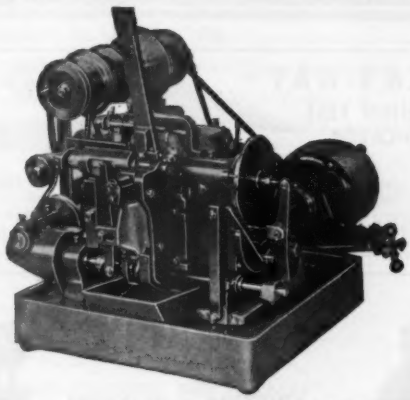
WALTHAM

PINION AND GEAR CUTTING MACHINES



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Send for detailed information and complete specifications.

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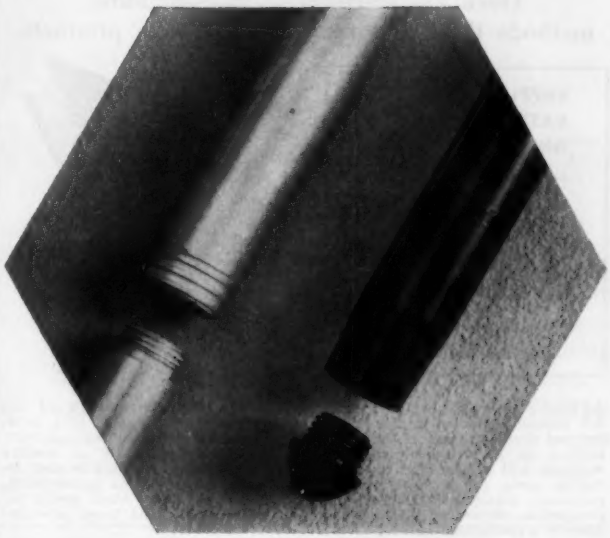
There is a right way to finish this aluminum part



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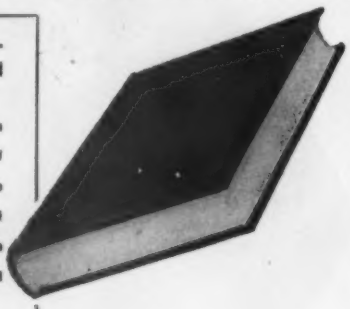
Here are economical, sales-building methods that produce more attractive products

SUPPLIES UP - TO - DATE INFORMATION ON:

- —the techniques involved in metal finishing
- —the commercial aspects of metal finishing
- —the sales value of attractive finishes
- —the economics of metal finishing
- —the design of parts which require finishing
- —new finishing equipment and processes
- —metal finishing costs



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Consulting Engineer, Executive Secretary, Masters Electric Plating Association

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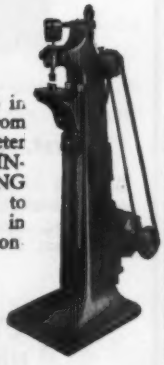

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Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG GRINDERS

HOLES from 1/64" to 8" Relocated and Ground within .0001" in One-Third Previous Time

Before hardening, this two-station die block was Moore-Jig-Bored to eliminate the need for excessive grinding. After hardening and surface grinding, all holes were Moore-Jig-Ground to exact size and location. Blank hole and center piercing hole were ground with ½° included taper. Little clearance could be allowed between punch and die. Jig grinding time: *only 2¾ hours.*

CONTOURS, Too, Accurately Jig Ground and Checked in One Setting

This flanged punch, impractical to grind by any other method, was a natural for the No. 2 Moore Jig Grinder. All radii—male and female—were ground accurately to location and size. The piece, having been set up on a rotary table, was aligned to permit grinding of the angular surfaces. And the entire contour was inspected by the "indicator measuring" method while the punch was still on the machine.

The word "versatile" must have been coined for the No. 2 Moore Jig Grinder. Not only does this machine relocate and grind straight and tapered holes with ease, but it contour grinds, chop grinds and slot grinds just as skillfully.

The Moore Jig Grinder, together with its toolroom teammate, the Moore Jig Borer, enables tool and die sections to be produced concurrently, puts diemaking on an interchangeable-parts-and-assembly basis. And it's also a time-saver on production jobs.

Employing the accurate lead screw measuring principle and a convenient system of coordinate hole location, the fast and sure Moore Jig Grinder eliminates hours of checking on bench and surface plate.

Why not find out how this remarkable machine can save *you* sizeable chunks of time and money. Write today for our detailed bulletin.

MOORE SPECIAL TOOL COMPANY, INC.
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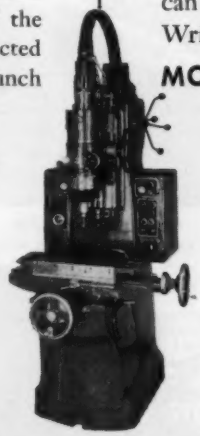
"HOLES, CONTOURS AND SURFACES"
is bound to become a classic to the man or shop that does accurate work."
American Machinist Book Review

424 pages — $5 U.S.A., $6 elsewhere



NO. 2 MOORE JIG GRINDER
Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up and down; spindle-housing heat control. Features slot grinding attachment.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

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Last from 2 to 10 times longer

Costing only slightly more than ordinary hardened steel gages, Taft-Peirce Electrolized Gages provide many times longer gage life.

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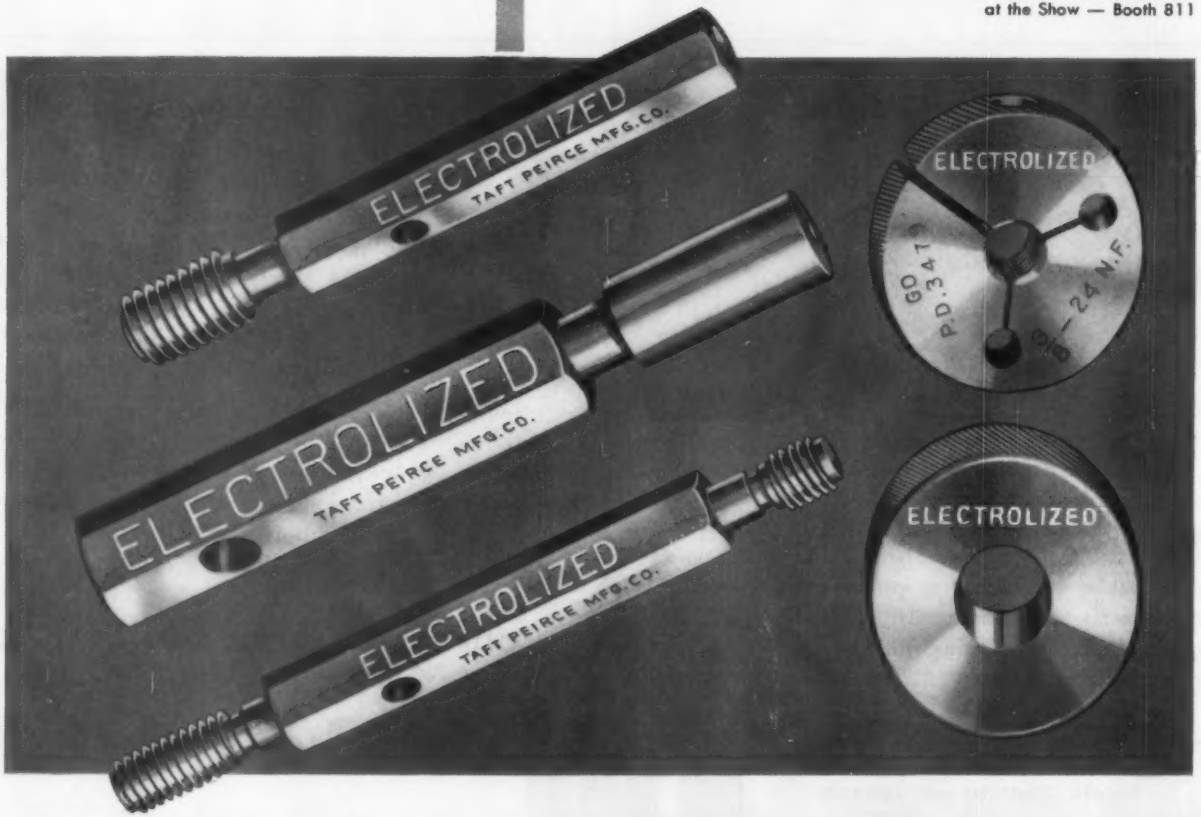

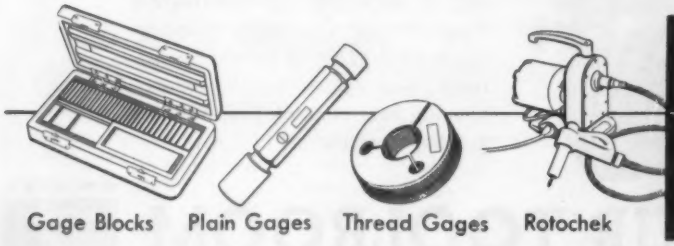

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T-P means Top Precision

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Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
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Useful for Design, Shop & Inspection Work
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Write for folder describing illustrated book
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No. 2½ Atlas Arbor Press, 6 Ton.
36" x 17 ft. Niles Engine Lathe, Double Geared.
30" x 30" x 8 Ft. Gray Planer, 2 Heads.
40" Cincinnati Upright Drill, Sliding Head.
PRECISION TOOL, DIE & MACHINE COMPANY, Inc.
1435 SO. SHELBY ST. LOUISVILLE 17, KY.

10' BETTS
VERTICAL BORING MILL
CLARENCE J. O'BRIEN
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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them
GENERAL PATTERN WORKS
2733 Buck Street Cincinnati, Ohio

10 to 12 ft. lengths
ALL METALS
Also Screw Machine Products to Order
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Makers of H & G Die Heads

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$8-9,000 — NO FEE
B.S.M.E. with hydraulic and servo-mechanisms experience for centrifugal governor engineering dept.
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O'SHEA EMPLOYMENT SYSTEM
"America's Largest"
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IN STOCK

BLISS 100-TON HYDRAULIC PRESS, 48" stroke, 30"x30" bed, 150 HP motor.
VAN NORMAN #111 CRANKSHAFT REGRINDER, 24"x84" capacity.
GLEASON 12" GEAR GENERATOR, straight bevel, single roll.
HEALD #81 GAGEMATIC - SIZEMATIC INTERNAL GRINDER.

Many others available— send for price list. All fully guaranteed.

Coastal Machinery Sales Co., Inc.
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Phone: Circle 6-6028

"World headquarters for machine tool values."

No. 4 B & S Automatic, M.D.
No. 2 B & S H.S. Automatic, M.D.
Gleason 3" Str. Bevel Gear Generator.
No. 3A B & S Universal Mill, M.D.
D. E. DONY MACHINERY CO.
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10'-16' CINCINNATI Hypro Extension Vertical Boring & Turning Mill, Late Model and Like New. Motor Drive.
No. 42B60 LUCAS Precision H.B.M., Auto. Positioning, 1951
No. 340-T G&L 4" bar Table Type HBM, M.D.
WIGGLESWORTH INDUSTRIAL CORP.
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ALL NEW PARTS
Tools ● Cams ● Bearings ● Collets ● Chucks
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Miscellaneous parts for New Britain, Gridley Automatic and Sundstrand Lathes.
—MUST SELL—
D. SADOWITZ & SONS
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P-6765, AMERICAN MACHINIST
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SAMSON
BUYS SELLS
STANDARD OR SPECIAL MACHINERY AND EQUIPMENT
FUNDS AVAILABLE
FOR PURCHASE OF SINGLE MACHINES OR COMPLETE PLANTS
SAMSON MACHINERY CO.
9A South Clinton St., Chicago 6, Ill.
Room 628A Phone CENTRAL 6-3229

WANTED
INGERSOLL PLANER MILLER
Must be 1938 or later—either 3 or 4 heads—42" up to 60" right to left—42" up to 60" under rail—approximately 20' table feed.
BOTWINIK BROTHERS OF MASS., INC.
3 Sherman St. Worcester, Mass.

WANTED
DIE CASTING MACHINE
750 Ton or larger Aluminum Die casting Machine wanted. Immediately. To handle 25 lb. raw castings, platen area 26" sq. or 10"x28".
NATIONAL COMPANY
24-16 Jackson Ave., Long Island City, N. Y.

WORLD'S LARGEST STOCK
PRESSES
JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34, PA. · GARFIELD 3-8700

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FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

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27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type, 1942.

18"x10' MONARCH "BB" Grd. Hd. Lathe, 72" centers, Taper Attach., Flame Hardened Bed, Late Type.

24", 36", 42" BULLARD Vertical Turret Lathes, New Era, Turret Hd., Side Hd. M.D.

No. 2, 4, 5, 1A, 4A WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

24"x10' AXELSON Geared Hd., H.D. Model "E" 28" Actual Swing, M.D., Taper Attach.

No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head.

25"/50"x12' LeBLOND Sliding Bed Gap Lathe, Geared Head.

MILLING MACHINES

No. 2-18 CINCINNATI Plain Auto. M.D., Late

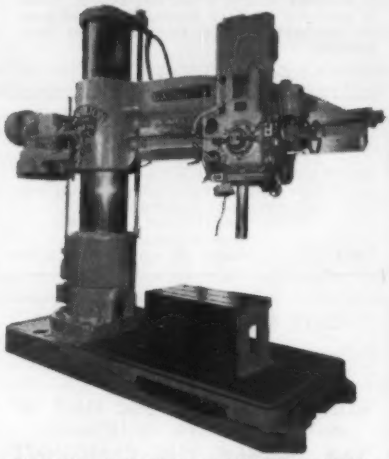
No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

No. 1-8 KENTS OWENS Hydraulic Horiz. Mill, Late Type, M.D.

6' arm x 17" column FOSDICK Economax Hydraulic Radial Drill, Motor on arm, late type. 1944

4'x15" CARLTON Radial Drill. Motor on arm.

DRILLING MACHINES



6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943

No. 262 BARNES Motor Driven Sliding Drill Press, 2" cap. in steel, 1941.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support. M.D.

No. 0, 1, 2 BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

No. 6 FEDERAL O.B.I. Press, 65 tons, cap., single geared, 4" stroke, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

36" ROCKFORD Hydraulic Openside Shaper, with Side Head, Late Type.

No. 20 WATERBURY FARREL Thread Roller, ⅜" cap. 1944, Motor Driven.

No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine. M.D. Late type.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

GRINDERS

30" INGERSOLL Face Mill Cutter Grinder, M.D.

6" x 18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

#3 Brown & Sharpe Univ. Cyl. Grinder, M.D.

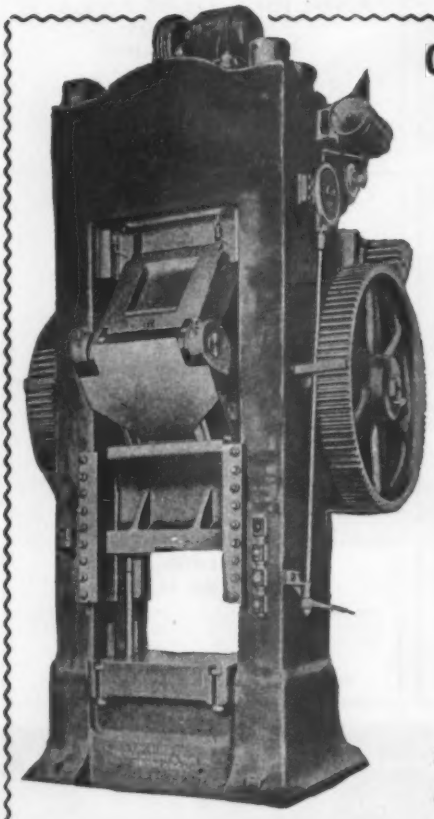
#TG615 JONES & LAMSON Thread Grinder, Lathe, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

5" UNIVERSAL HORIZONTAL BORING. MILLING, DRILLING MACHINE. TABLE TYPE, 55" x 91" Table, 24 Spindle Speed 7.0 to 850 RPM. NEW in 1948.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES



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PRESENT DAY PRICE Approximately $48,000

OUR PRICE $29,500

TOLEDO NO. 667 KNUCKLE JOINT PRESS. 1200 TON.

PRICE $22,500.

TOLEDO NO. 794½B 200 Ton, Double Crank, Toggle Drawing Press.

TOLEDO NO. 168½ 340 Ton, Single Crank.

Send for our 32 page illustrated Catalog

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Type A Barber Coleman, Late
Broaches—Late Type—10-20-30 Tons
100" Betts V.B.M. 2 Swivel Heads
8-Sp 16" Type D Bullard Multaumatic
36x120 Cinn. Horiz. Hydrotel Late
68"x21' C C Bridgeford Geared Head
16"x72" Cincinnati Cylindrical 1942
16"x36" Norton 1942
1212A Excello Boremastic
BL2416 Keller 3 Dim. 1942
R-6 Pratt & Whitney Grinder
36"x8' Betts Geared Head 1942
42" Bullard VTL 1942
2-18 Cincinnati R&F Prod. Mill 1942
84"x20' Ingersoll Planer Mill

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EXpress 1-0700

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BORING MILLS, 84" King, 3 Hds., 1943
54", 42" & 24" Bullards
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4" & 3½" Bar Landis, Floor Type (2)
3¾" Bar Defiance Tble Type, Late
3" Bar Universal, Tble Type.
GRINDERS, 12"x48" & 10"x96" Landis, Late (2)
60" Hanchett Vert. Spin. Surf., Hyd.
RADIAL DRILLS, 413" Col. Cinci. Bick., '44
5'15" Col. Carlton & Amer., M.-on-arm
GEAR SHAPERS, Nos. 645A3, 61A, 61 Fellows
KEYSEATERS, Nos. 5, 4 & 2 M. & M.
LATHES, 16"x154" Cen. Hendey, T.A., Tim.
GEAR HOBBER, 80" Capty. Pfauter, No. 4
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USED MACHINERY

Columbia 10' Power Square Shear 3/16" cap.
Baush 44" Vert. Boring Mill 2 heads
Knight #40 Vert. Jig Borer
American 20"x8' Grd. Hd. Lathe motor in base
Landis 20"x72" and 18"x96" Plain Ext. Grinder
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" tble.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Red Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 13" hollow spindle.
Cincinnati No. 2 HI-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf Grinder 20" chuck.
Campbell No. 215 abrasive cut off 1944.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Ret. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt #25 Box. Col. 1-Sp. Hvy. Drill.
L & N 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 20" stroke open-side Shaper Planer.

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- No. 27 New Britain 3 Spindle Boring Machine. 1951
- No. 36 Hanchett 36" Grinder 1942

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NEW BRITAIN GRIDLEY Model 665; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal
JIG BORERS
DEFIANCE Boring Mill 3¼" bar; late type
DIXI type 60 Swiss Jig Borer; 2.362" bar; late type
FOSDICK #30A Jig Borer; late type
GIDDINGS & LEWIS 340-T; 4" bar; late type
HEALD 40, double end Borematic; M.D.
HY-OP #51 Jig Borer; late type
LUCAS #21 2½" bar; table type
NILES 8" bar; floor type; motor drive
SELLERS 5" Boring Mill; motor drive; late type
UNIVERSAL "Tri-Way" 3" bar; late type

BORING MILLS—Vertical
BULLARD 8", 8-spindle & 16" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 24" spiral drive; PRT; late type
CINCINNATI 54" Hypro, motor drive; late type
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
AMERICAN #T-632, motor drive; late type
CINCINNATI 1-30 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late
COLONIAL VBI-10-48 Vertical; Hydraulic; late type
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Manufacturing
AVEY #2—2 spindle high speed, motor drive, late
BARNES #262 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
CLEVELAND "A" 5⅝" single spindle; late type
LELAND-GIFFORD 1LMS, 4-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 2-spindle, M.D.; late
NATCO B-4-B "Hole Steel" 60 adj. spindles; late
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO E-5 high speed, 10 adj. spindles; late

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 48 High Speed Gear Shaper; Internal cap. 72" diameter; late type
FELLOWS No. 61A & 615A High Speed Gear Shaper
FELLOWS No. 672 High Speed Gear Shaper; late
FELLOWS No. 7A, No. 72 and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late
FELLOWS 20-M Rod Liner; New 1954
FELLOWS 24-M Involute Measuring Machine; 1954

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late type
GLEASON No. 17 Hypoid Tester & Lapper; late type
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Tester; latest type
GLEASON 22" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 37" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
BROWN & SHARPE #3 Univ. motor drive, late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 8"x18" Mod ER Plain, "Filmatic"; late
LANDIS 20"x144" Plain Cyl. gap type, M.D., late
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 10"x36" type DC plain hydr. with infeed; late
LANDIS 16"x36" type "C" Universal, M.D. late
LANDIS 20"x144" Plain Gap Grinder; late type
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type

GRINDERS—Internal
BRYANT #5 internal, hydraulic, late type
BRYANT #16-C-16 Internal, Hydraulic, late
BRYANT #24—36" Internal, hydraulic
HEALD #70A Internal, motor drive, late type
HEALD #76 Centerless; motor drive; late
HEALD #81 pl. chuck type, hydraulic; New 1947
BLANCHARD #18, motor drive; late type
BROWN & SHARPE #2, motor drive; late type

LATHES, Turret
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late

LATHES, Engine & Mfg.
AMERICAN 16"x102" centers, "Pacemaker"; late type
AMERICAN 36"x25" c.c., PRT; 2 cross slides; late
GISHOLT #12 Hydraulic Automatic; motor drive; late
HENDEY 24"x36" centers; motor drive; late type
HENDEY 16"x72" centers; M.D., late type
LeBLOND 20"x48" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
MONARCH 16"x54" Centers, Motor Drive
MONARCH 16"x78" centers, Model CW, Timken, late
MONARCH 16"x78" c.c. Model CW; Timken; late type
MONARCH 20" (raise to 3½") x 144" c.c., late type
MONARCH 24"x96" centers; motor drive; late type
NILES 30"x108" c.c. Geared Head; Timken; late
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SPRINGFIELD 20"x40" c.c., motor drive; late type
SUNDSTRAND 18"x60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHARPE #2B, motor drive, late type
BROWN & SHARPE #10, motor drive; late type

MILLING MACHINES, Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x30" and 6"x72"; #HT 12"x24" and #HT 12"x36" centers; late type
MOREY 12"x30" and 12"x100" centers; late type
CINCINNATI 2MH horizontal univ., motor drive, late
BROWN & SHARPE #2 Light Type, motor drive; late

MILLING MACHINES, Vertical
CINCINNATI #4 High Speed Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
MILWAUKEE #4-H Vertical; late type
STEINEL SV4d, #30 taper, 6 spindle speeds; latest

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SOUTHWARK plate-edge Planer; 16 ft; late type

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NATIONAL #5 "Maxi-Press", 1000-ton cap. H.S. Forging Machine; M.D.
WATERBURY FARREL #9, 125-ton cap., M.D.

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GOULD & EBERHARDT 32"; High Speed; M.D.
HENDEY 12" High Speed Univ. Crank Shaper; late
MOREY 8" Vertical; motor drive; late type
ROCKFORD 16" Shaper, motor drive; late type

MISCELLANEOUS
ALEXANDER #2, 3-dim. Engraving NEW 1952
AVEY No. 2, 2-spindle Drill Press; late type
BARNES No. 172 Honing; M.D., hydr.; late type
HILLES & JONES #7 Plate Bending Roll; capacity ⅞" x 16"; motor drive
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No. 6 DRELX Potter & Johnston, m.d., later type
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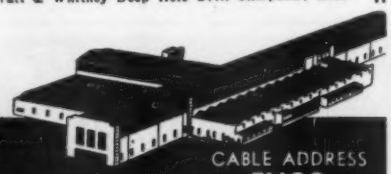

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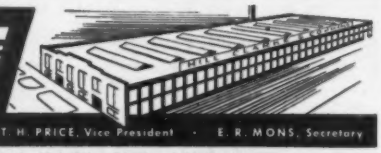

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20"-32"x144" Norton Gap
20"x192" Norton Type A Plain
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No. 74 Heald Int. Centerless
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No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16-28 Bryant Internal
No. 16A16 Bryant
No. 16A-28 Bryant Internal
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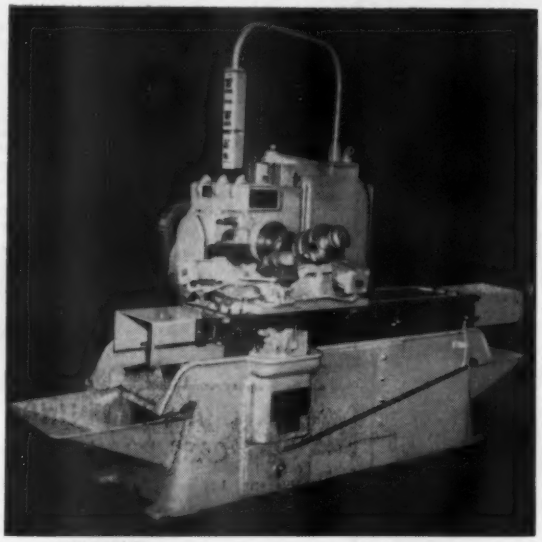

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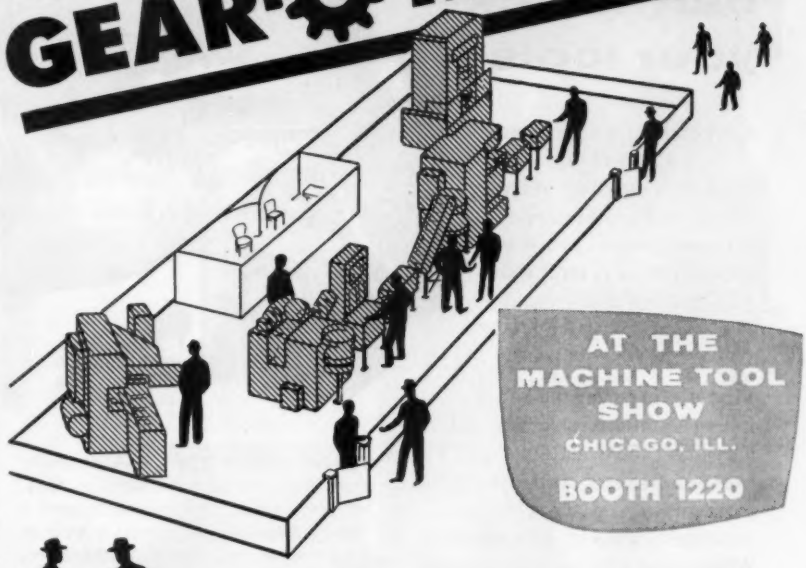

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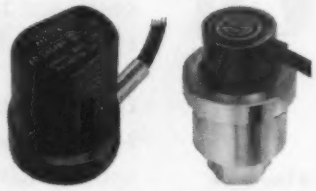

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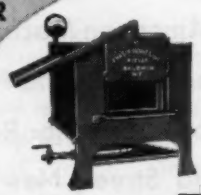

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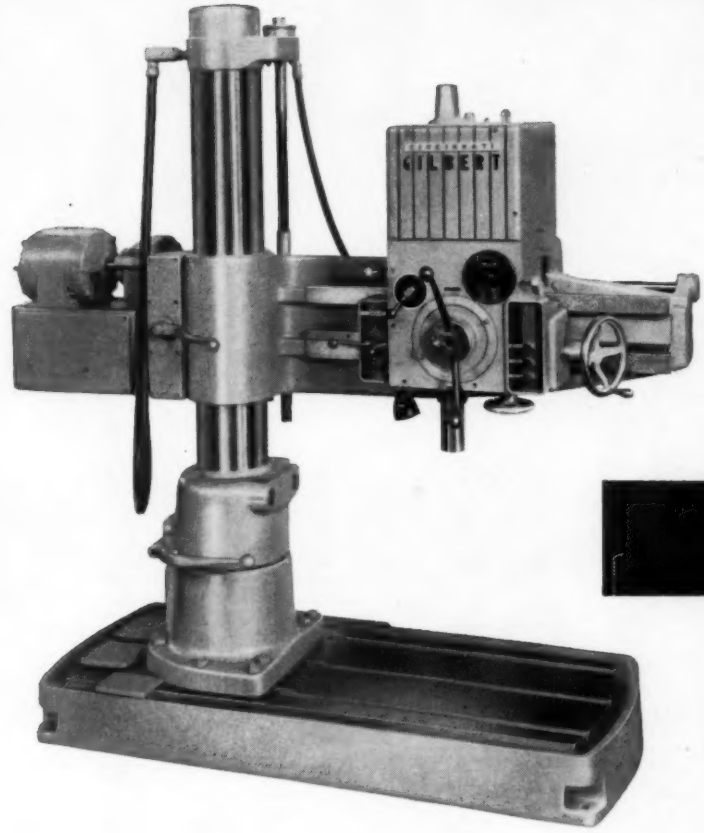
WBD 5352

AL® FINE TOOL STEELS SINCE 1854



NEW

- 9" column; 3' or 4' arm
- spindle speed ratio of 40-to-1
- 12 speeds (up to 3200 rpm) through direct-reading dial
- automatic tapping reverse
- adjustable spring counterbalance (feel remains the same from lightest to heaviest tools)
- hardened tang slot
- safety elevating nut and screw (arm can't drop or overrun)
- rigid, accurate spindle mounted on 5 precision ball bearings

This *completely new* light duty 3 HP radial gives you more advances for your money than any machine of equal capacity, at a price that makes replacement easy and attractive. At the left are some of the features that put you ahead when you own this Gilbert. Your replacement dollar is worth more when you buy a Gilbert. Write for Bulletin Number 255.

The Cincinnati Gilbert Machine Tool Co.,
3366 Beekman St., Cincinnati 23, Ohio

those who buy Gilbert buy **GILBERT** *again*

Graph-Mo® steel die makes this "impossible" draw without galling or scoring

MANUFACTURERS Service Company in Cleveland was faced with a tough problem of making a die for a dryer fan housing 3⅜" deep. The scroll shape made it an all but impossible draw for ordinary die steels—they'd pick up and gall. Looking for an answer, they tried Graph-Mo®—one of four graphitic tool steels developed by the Timken Company. Result: good clean parts, no scuffing, no galling, no scoring.

Graph-Mo tool steel can handle jobs like this because of its unique composition. It contains free graphite, one of the best natural lubricants. This graphite gives Graph-Mo outstanding anti-friction properties and prevents scuffing and galling even in such difficult draws as this one.

Graph-Mo has a second great advantage over conventional tool steels: It outwears them on an average of three to one. Along with the graphite, Graph-Mo contains millions of tiny particles of diamond-hard carbides, one of the hardest-wearing substances known.

Despite its superior wear resistance, Graph-Mo machines about 30% easier than conventional tool steels. And it responds uniformly to heat treatment, thus requiring a minimum of grinding on the hardened dies.

Graph-Mo is one of four graphitic tool steels developed by the Timken Company. Would you like more information about their uses in dies, punches, gages and machine parts? Write for the new Timken Graphitic Steel Data Book just out. The Timken Roller Bearing Company, Steel & Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING